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CURRENT BRIDGE CONSTRUCTION IN CENTRAL IOWA

By JOHN C. BLACK

Field Editor, Roads and Streets

A TRIP through portions of Iowa in September disclosed a tremendous amount of bridge construction recently completed and in progress. Pictures of some of these jobs and brief descriptions of certain features are given herewith. An account of the new structures on the rerouting of U. S. Routes 20 and 169 through Fort Dodge was given in the December 1936 issue of ROADS AND STREETS, and important bridge and viaduct work in Des Moines will be described in February. Only a few of the many interesting and important projects throughout the state are noted here.

The 1937 bridge construction program planned by the State Highway Commission includes structures ranging from a 4,560 ft. viaduct to 24 in. pipe culverts. All are designed for H-15 A.A.S.H.O. standard loading. All designs are prepared in the office of the commission under the direction of E. W. Blumenschein, Engineer of Bridge Design. The costs here given are exclusive of engineering and other overheads.

Pier Construction on Belleville Bridge over Des Moines River.

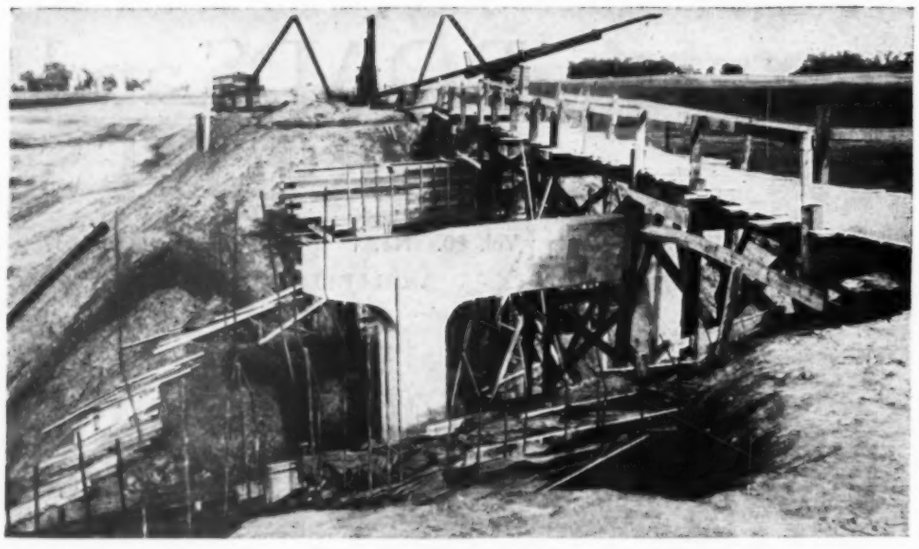
Belleville Bridge Over Des Moines River on County Line Between Hamilton and Webster Counties

This bridge is located on a "County Trunk Road" a few miles from the town of Stratford, and is one of the largest and most expensive structures outside the State highway system. It replaces a light steel truss which is inadequate for present day loads in design and also because of deterioration. Several hundred feet of the west approach to this old bridge was washed out in the high water of 1934, and has been replaced by a temporary timber trestle.

The new structure parallels the old at a distance of about 200 ft. It will consist of four steel trusses each 130 ft. long and two 50-ft. approach spans; total length 620 ft.

A. Olson & Co. of Waterloo, Iowa, have the construction contract at a bid price of $70,762. Financing is by W.P.S. appropriation. W. W. Winslow is resident engineer.

The picture, taken September 8, shows water being pumped from the cofferdam of one of the main piers, the dam having filled during a sudden rise in the river a few days earlier. The tractor supplying pumping power stands several inches deep in water. The low water of the past season was of great assistance in river construction, but evidently could not be trusted too far. The spoil bank in right background is from a channel straightening excavation.



Construction of a Typical Crossing over Railroad.

Grade Crossing Elimination on State Highway Southeast of Ft. Dodge

The photograph indicates the type of substructure favored by the Highway Commission for this class of bridge—piers at each side of track with a small abutment for the approach span near the top of fill. Both piers and abutments are founded on creosoted batter piles.

I-Beam Bridge Carrying U. S. Route 65 over Tracks Near Hubbard.

Short piles are used for the abutments, it having been found that a pile driven part way into a well compacted fill has greater bearing power than a pile driven through the fill into natural ground. In addition to the saving in cost of piles, a further saving results from the smaller and cheaper equipment required for pile handling.

Form edges, projecting reinforcement and cloth covering fresh concrete in the abutment can be seen in the foreground of the picture.

Ellsworth Arch on State Route 175.

The smaller picture shows a recently completed grade crossing with the same type piers and abutments, on U. S. Route 65 near Hubbard in Hardin County. It is a continuous I-beam structure, the end spans being designed as cantilevers.

Arch on State Route 175 Near Ellsworth in Hamilton County

Here is another structure with a grace and fine detail of which the designers may properly be proud. Its span is 50 ft. between springing lines. Roadway is 24 ft. There are no sidewalks. It was completed early in September by the Zitterell-Mills Company of Webster City, Iowa, about 4 months having been required for construction. Cost $13,210.

John Reed, resident engineer, was in charge of construction.

Bridge Over Raccoon River on State Route 90 in Dallas County Southwest of Des Moines

This structure was completed, except for the deck, when I visited it on Sept. 9. It consists of two 150-ft. trusses with I-beam approaches having a combined length of 364 ft. 3 in. Total length of bridge 664 ft. 3 in. The roadway is 24 ft. wide; over-all width 27 ft. on both trusses and approach spans.

The approach spans are carried on H-section steel piles weighing 42 lbs. per ft., which are driven to practical refusal in shale at depths ranging from 38 to 39 ft. below ground level. The piles extend into the concrete caps to within 6 in. of the top. They are encased in concrete, the minimum covering being 3 in. This encasement extends to a depth of 6 ft. below ground. There are 4 piles to each bent. The alignment appears perfect, both longitudinally and laterally. The handrail is of 3 x 3 x ¼ in. angles on I-beam posts.

Another interesting feature of this bridge is the concrete rip rap protecting the ends of approach fills. It consists of blocks 7 in. thick, measuring 36 in. up the slope, and with widths from 24 to 36 in. This rip rap is cast in place in one operation, horizontal divisions between block rows being made with tarred paper, while thin wood strips are used for separation between blocks

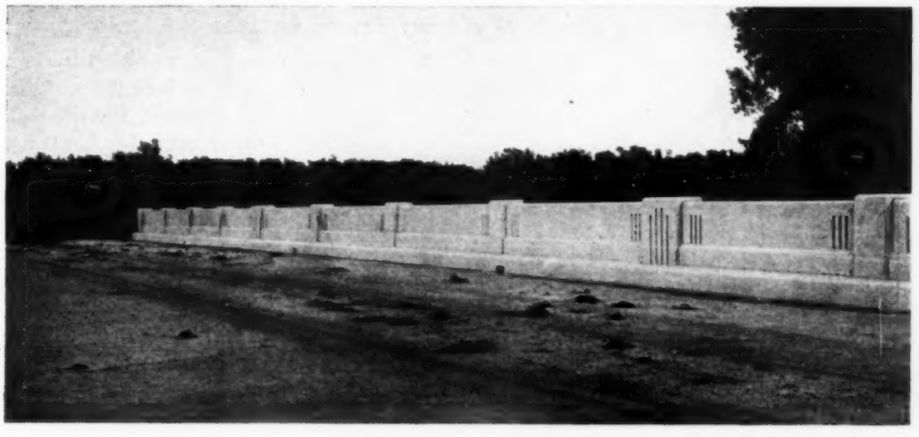
Raccoon River Bridge on State Route 90.

in the line of slope. The blocks are reinforced with welded wire mesh. The curved surfaces are determined by strings stretched from center points beyond the top of the slope and swung in arcs at the bottom.

This type of construction is experimental, it is reasonably cheap, and the designers believe that settlements can be more easily corrected and a good appearance maintained at less cost than with any other type.

The cost of this bridge is $58,096.

Snyder and Johnson of Humboldt, Iowa, were the contractors on this job. J. A. Karr was resident engineer.



Deck of the Smaller Bridge on Route 90. No, this picture does not indicate a return of the horse era: the deposits are just good Iowa mud brought in on truck wheels.

Another Bridge on Route 90 in Dallas County

A few hundred yards beyond the last described structure is a smaller bridge of interesting and artistic design. It spans a tributary of the Raccoon, and like its neighbor, has approach fill ends protected by concrete rip rap cast in place.

The two piers are founded on steel H section piling and the I-beam spans are continuous over them. The modernistic concrete rail is well illustrated in the picture. The length is 125 ft. 4 in. and over-all width 27 ft. The cost was $10,970. Contractors and supervising engineer were the same as on the Raccoon River Bridge.

Melbourne Subway

State Route 88—an almost straight connection between Marshalltown and Des Moines—is now being paved with concrete 20 ft. wide. This highway is destined to carry heavy traffic, and the elimination of railway grade crossings is accordingly essential.

At the intersection with the line of the Chicago, Milwaukee and St. Paul near Melbourne in Marshall County the highway dips to an under-pass, while the double track railroad is carried on a large plate girder structure with an all-welded iron deck. The entire cost of the separation, amounting to $64,961 is borne by the state.

The girders are 77 ft. long on a sharp skew. Over-all width is 33 ft. The girder depth is 8 ft. 6½ in. Floor beams are 27 in.—CBX 177 lb. I-beams. The deck is of ½ in. wrought iron electrically plug-welded to the beams and turned up to a height of 4 ft. 5½ in. at each side. The total structural steel amounts to about 360,000 lb.

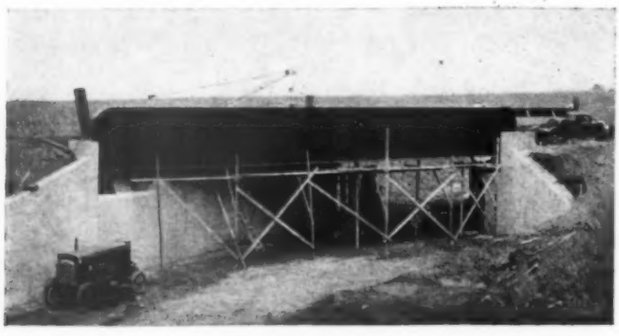
G. G. Herrick Construction Co. of Des Moines has the contract for the entire bridge and for about ½ mile

The Smaller Bridge on Route 90. Even an I-Beam structure can have grace and good detail.

Dirt-moving at Melbourne Subway. The dragline is borrowing for fill farther on, while the tractor with "tumblebug" evens up the surface.

of grading and paving in connection with it. J. B. Durham is resident engineer.

Grading was still uncompleted on Sept. 10 when the accompanying pictures were taken. At that time the contractor was moving about 800 yds. per day on a



Separation of State Route 88 and C. M. & St. P. near Melbourne.

300 to 400 ft. haul, using an old-model Northwest dragline with one-yard bucket, six 1½ ton Chevrolet trucks and a Sidney 2 cu. yd. rotary scraper pulled by Caterpillar tractor.

Lucas Overhead on U. S. Route 34

Near the town of Lucas, 40 miles south of Des Moines, the Chicago, Burlington and Quincy Railroad is making a heavy cut to reduce a steep grade on its important freight line. A county road (a unit in the Iowa State secondary system) crosses this work approximately at right angles, and the state is putting in a 108-ft. steel arch to carry it over.

The work embraces several interesting features. The new railroad line closely parallels the old, which will be retained for the down-grade haul. The cut, where it intersects the highway will be 27 ft. deep. Although the railroad plans only one new track at the present time, the cut is being made full double track width for future development. The highway crossing will be of sufficient height to carry it above the old railroad line, which is practically at ground level a few feet back from the north side of the cut. The span over the old line will be a 56 ft. I-beam.

The railroad's grading job, now practically complete, involves a total of about 1,124,000 cu. yd. Edward Peterson of Omaha, Neb. is contractor. On Sept. 10 excavation was being carried on with a Lorain 87 crane and a 2-yd. dragline bucket. Hauling was with Euclid Trac-Truks of 7 cu. yd. level capacity but actually carrying about 9 yards with heaped-up loads.

The bridge will have a total length of 320 ft.—108 ft. in the main span and 212 ft. in the 5 simple I beam approach spans. The arch abutments are founded on stiff clay. The contract of $31,934 for the entire structure was let to Ben Cole and Son of Ames, Iowa, on

The Burlington Railroad's Big Cut Near Lucas. On the right bank a Speed Crane with ⅝ yard bucket is excavating for arch abutment. The crane in foreground is a Lorain 87 with 2 yard bucket. The wagon is a Euclid Trac Truk with a nominal 7 yard but actual 9 yard capacity.

South Abutments for the Lucas Arch, and Pier for Approach Spans.

Aug. 4, 1936. Completion is scheduled for May 1, 1937. C. R. Bentz is resident engineer.

Crossing Over Railroad at Centerville

State Route 60 is being carried over 3 tracks of the Chicago, Rock Island & Pacific Railroad at Centerville near the Missouri border. The crossing is at a sharp angle, and involves a main span of 113 ft. 2 in. of plate girder and I beam construction, which, in spite of the angle will not be skewed. It will rest on an interesting type of 4-column pier, construction of which is shown in the picture.

Other spans will consist of an 80 ft. 10 in. plate girder and 6 I-beam spans totalling 284 ft. Total length of bridge will be 526 ft. It will carry a 24 ft. roadway with no sidewalks. Overall width will be 27 ft. Cost is estimated at $63,574.

Des Moines Asphalt Company of Des Moines, Iowa, is the contractor, and H. H. Zimmerman is resident engineer.

Piers for Centerville Grade Separation. Sept. 9, 1936.

Purdue Road School and Show Set for Week of January 25th

The twenty-third Annual Road School and Road Show of Purdue University, Purdue, Indiana, will be held during the week of January 25th. The County Road Supervisors' Association and the County Surveyors' Association have prepared especially interesting programs for their independent sessions. The Highway Materials and Equipment Association has arranged for the largest road show ever held on Purdue campus.

An innovation this year, at the separate sessions of both the Supervisors and the Surveyors, will be a period of time devoted to a "question box" session. County officials having particular questions in mind about road affairs are invited to submit these questions to Ben H. Petty, Editor, *Highway Extension News,* Purdue University, in writing, any time prior to the opening of the Road School. An attempt will be made to secure competent parties to prepare answers on these various questions and these answers will be presented at the question box session.

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American Society of Municipal Engineers and International Association of Public Works Officials Combine

Consolidation of the membership of The American Society of Municipal Engineers and The International Association of Public Works Officials to form American Public Works Association is announced as of January 1, 1937. The formal joining of their programs of activity will enable the new association to be of greatly increased service to the public works profession. The headquarters of the American Public Works Association will continue to be at 850 East Fifty-Eighth Street, Chicago, Illinois.

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Chicago to Have 160,000 New Street Signs

On Dec. 31, the Federal Electric Company of Chicago submitted a low bid of $5.48½ each on the erection of 160,000 new street signs in the city, a project to be financed jointly by the city and the public works administration.

At the time of going to press, ROADS AND STREETS had not learned whether or not the bids had been approved by the Commissioner of Public Works and the PWA. The city has appropriated $50,000 for the work and a grant of $43,200 has been offered by the PWA.

Specifications call for the erection of one large sign, partly overhanging the intersection and visible from all sides. Another bidder, the Metal and Glass Products Company of Chicago, presented figures on the signs, brackets and labor costs separately for a total of $6.04 each. The Able Sign Erectors bid $1.50 on the placing of the signs alone.

The Federal Electric Company two months ago was the sole bidder on the project with a figure of $5.73. Its offer was rejected and new bids were asked.

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"Can I trust him?"

"Why, he's so crooked that the wool he pulls over your eyes is half cotton."

Progress on Soil Cement Roadways

Important Experiments and Tests by Various States and by the Portland Cement Association

THE South Carolina State Highway Department started experiments on soil-cement mixtures in 1932 which promise to have far-reaching influence on the construction of secondary roads.

These early experiments on the effect of mixing soil, water and cement were so stimulating that the Portland Cement Association, through its Development Department, started in January, 1935, a comprehensive laboratory investigation to determine basic principles involved in soil-cement mixtures and the commercial possibilities of this process.

The preliminary phases of this investigation included a survey of all available technical information on soils. The work of R. R. Proctor, reported under the title, "Fundamental Principles of Soil Compaction" in ENGINEERING NEWS-RECORD of August 31, September 7, September 21 and September 28, 1933, seemed especially significant. Proctor's investigations showed a definite relationship between the moisture content, practical field compaction and resulting density for natural soils. The Portland Cement Association investigation showed that these same relationships held true for soil-cement mixtures.

Accordingly, laboratory specimens were prepared by the Proctor method, incorporating optimum moisture with variable quantities of cement in a wide range of natural soils. To test the durability of the resulting soil-cement specimens and to evaluate the cement factor required, severe durability tests were devised and used. For each soil-cement combination, one set of specimens was subjected to alternate wetting by immersion and drying in an oven of 160°F. Another set was alternately frozen and thawed. Observations of volume change, moisture change and slaking loss were made. To evaluate more clearly the effect of varying cement factors, the specimens on which slaking loss was observed were wire brushed between each cycle of wetting and drying or freezing and thawing.

The results of these studies were so promising that further field experiments, based on laboratory conclusions, seemed fully warranted.

Following the methods and test procedure suggested by the Portland Cement Association studies, the South Carolina State Highway Department conducted tests on the soil for a proposed experimental road project 1½ miles long near Johnsonville and built the project in the Fall of 1935, following the procedure suggested by the laboratory studies. The Portland Cement Association co-operated on both laboratory studies and the field construction. Excellent correlation between laboratory and field practice was obtained and the possibility of working out field procedure, using laboratory principles, was clearly demonstrated.

A paper on this project was delivered by Mr. W. H. Mills, Jr., Testing Engineer, South Carolina Highway Department at the November, 1936, meeting of the Highway Research Board.

In June, 1936, South Carolina built by day labor another soil cement road two miles in length near Loris, and now has under construction a 10.5-mile job in Hampton County.

Other states became interested. In 1936 the Association co-operated on laboratory studies and field construction of further experimental projects as follows:

Constructing Agency	*Location of Project*	*Width*	*Thickness*	*Length*
Michigan State Highway Dept.	Cheboygan Co., near Cheboygan	20 ft. and 22 ft.	6 in.	1.27 mi.
Ill. Div. of Hwy. and Winnebago County	Winnebago Co., near Rockford	18 ft.	6 in.	1.12 mi.
Wisconsin State Highway commission	Adams County, near Friendship	22 ft.	6 in.	1.65 mi.
Missouri State Highway Dept.	Moniteau Co., near Tipton	22 ft.	6 in.	1.56 mi.

These projects have materially advanced construction technique and observations of them will be helpful in determining the durability of soil-cement mixtures under severe northern climatic conditions and in correlating the effects of field exposure with laboratory durability tests.

The original research work of the Portland Cement Association is being supplemented by further basic research on soil-cement mixtures under the supervision of Frank T. Sheets, Consulting Engineer and Director of Development, with M. D. Catton, of the Development Department, in direct charge of the investigation.

Aboreal Tunnel at Stillman Valley, Ill., on State Route 72. This might Have Been Merely Another Piece of Flat Road Through a Country Town.

SOME RECENT DEVELOPMENTS IN THE USE OF ASPHALT

for Road and Street Construction

By BERNARD E. GRAY
Chief Highway Engineer, The Asphalt Institute

1936 has been a year of extreme temperature and rainfall conditions, and particularly during the winter and spring months exceptionally severe conditions prevailed through the mid-south with frost penetrating to depths much beyond the average and with the alternate freezing and thawing so damaging to thin surfaces. In a number of instances there was considerable break-up and an opportunity was afforded to determine critical thickness and the effect of deferred maintenance on all types of surfaces. A careful analysis indicated that only very thin surface treatment on rather inadequate bases had suffered any considerable damage, and that even here treatments that had been kept well sealed had given a good account of themselves.

Vermont: Surface Treatment over Macadam with RC-3 Cutback Asphalt and Fine Crushed Stone.

Probably the most interesting item about the whole matter was the rapidity with which repair was accomplished, in many instances involving the addition of new foundations, the drainage of previously unsuspected low areas, and the rehealing of surfaces to a new and better condition. All higher types, such as road-mix, penetration macadam, and hot-mix surfaces, suffered no more than the normal wear and tear according to their age.

Soil Stabilization

The most interesting development of the past year has been the increasing recognition of the importance of soil stabilization. This term has been used in a somewhat confusing fashion, so that to many it means stabilization with some commercial product or another. Fundamentally, soil stabilization is any method whereby the condition of optimum moisture content is maintained in a large measure throughout the year. The method of soil stabilization should be determined only after a careful examination of local climatic conditions and the availability of stabilizing materials. Where aggregates are cheaply and abundantly present, there is no better method of stabilization than to make a so-called

Arkansas: Dense Graded Road-Mix with Asphalt on U. S. 167.

West Virginia: Soil Stabilization with MC-2 Cutback Asphalt.

"soil concrete" using mineral aggregates with a minimum size of 1¼ in. graded down to the 200 mesh material so that maximum density is obtained. Such a mixture has high stability but may not have very high resistance to abrasion, so that some form of a binder or wearing course, such as chemicals or bituminous materials, is usually desirable. The amount of aggregate to be added should be determined after a careful study of the soil and its behavior with such aggregates, and full advantage should be made of laboratory facilities for this purpose.

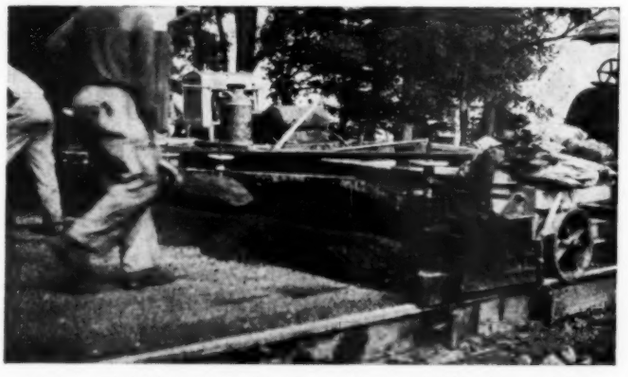
Where aggregates are not cheaply available, soil stabilization with bituminous materials alone has taken two principal forms—one, the so-called "sub-oiling" method, the other the mix method. They have both been described in detail in the technical press and only a resume will be made here. The methods apply to all kinds of soils, ranging from pure clay to almost pure sand, except that with the sandy soils the mix method is used almost universally because of the rapidity of mixing operations with multiple blade graders and other blade equipment. The sub-oiler has been used principally with the clay type of soils and appears well adapted to this purpose.

In either case the surface to be treated should be scarified to the full depth of the treatment and the breaking up of the soil should be accomplished until a uniform condition prevails with few lumps over an inch in diameter. For sub-oiling, a special piece of equipment is used consisting of an "A" frame carrying a number of teeth and having behind each one a small pipe running almost to the point. These pipes are connected to a larger pipe on top of the frame and in turn coupled with a hose to a distributor which moves along as the frame is dragged through the scarified surface.

New York: Marking the Edges of Asphalt Surface Gives High Visibility for Night Driving.

The liquid asphalt is pumped in one application to the bottom of the scarified earth and later becomes diffused upward by capillary pressure until the entire overlying soil layer has been permeated and bonded together.

In the mix method, the soil is scarified and then treated with a liquid asphaltic material in one or more applications of 0.5 gallon each, followed by disc harrowing until a fairly uniform mixture has been obtaind. For depths over 3 in. the upper 3 in. should be first treated with about half of the total amount of asphalt to be applied to that layer and then bladed to a windrow on either side of the road surface. The lower layer then should be treated, harrowed, and mixed until in a uniform condition, after which it should be compacted by light rolling. The windrows at either side are then brought back over the surface in thin layers interspersed with light applications of asphaltic material until all the earth has been spread and all of the asphalt has been added. Blading and light rolling are then continued until a solid, uniform surface is obtained. While these mixtures are almost completely waterproof, they are not completely resistant to abrasion and as a rule a light seal coat with some granular aggregate is desirable for the highest efficiency, especially as traffic increases.



Ohio: Finishing Asphaltic Concrete on a Widening and Resurfacing Job near Toledo. Machine Operating on 9-in. Steel Forms.

Asphalt Surface Treatments

In the surface treatment field there have been a number of developments over those reported a year ago. When the liquid asphalt specifications were adopted in revised form several years ago, the usual recommendation for asphalt primer was the MC-1 grade. However, subsequent experience indicates that there are many situations where the MC-2 grade should be substituted in its stead, the criterion being the presence of 200 mesh material. Thus for waterbound macadam with limestone, dense limerock, dense top soil, dense sand-clay, etc., the MC-1 grade will function best as primer. With waterbound macadam of open texture as made from gravel, etc., the MC-2 material is to be preferred.

For seal coat work there is a growing use of MC-3 products, particularly where light treatments are desired and where smaller size aggregates should be employed. There is a distinct advantage in using the heavier MC products for surface treatments where practicable, especially in climates subject to severe winter conditions, because the residue is a soft asphalt cement of around 200 penetration and thus more ductile under low temperatures. Such treatments are often applied over old dry sheet asphalt and asphaltic concrete streets, as the kerosene type of distillate will cut back the old surface slightly and give a livening effect, so that cracks and crevices become completely sealed. The rate of applica-

tion is seldom in excess of 0.2 gallon per sq. yd., and the aggregate cover should be approximately ⅜ in. maximum down to 20 mesh sieve.

The MC grades of cutback asphalts also are being used as winter cold patch material, even with ¾-in. stone, and for the same reason as cited above, of having a softer asphalt residue. The binding action in a patching mixture is directly proportional to viscosity, and under winter conditions the binder in a patch cools rapidly before it has a chance to set, and therefore the asphalt residue should be distinctly softer than for summertime patching, so that during consolidation under traffic there can be rehealing and recementing of the particles, thus preventing ravelling. MC-3 is recommended for at least a trial in such work in place of the RC-2 material so widely used for summertime cold patch work.

In regard to surface textures, the past year's experience under the almost universal use of balloon tires, not only on passenger vehicles but on trucks as well, indicates the desirability of finer textured surfaces. There can be no question that surface reaction under balloon tires tends toward tearing up rather than ironing out, and there is no need of constructing a coarser texture than desired in anticipation of closing up under traffic unless the surface underneath is so soft that the cover aggregate is driven into it by the weight of traffic. These factors should be evaluated prior to any retreatment operations, but in general the finer textures are to be preferred.

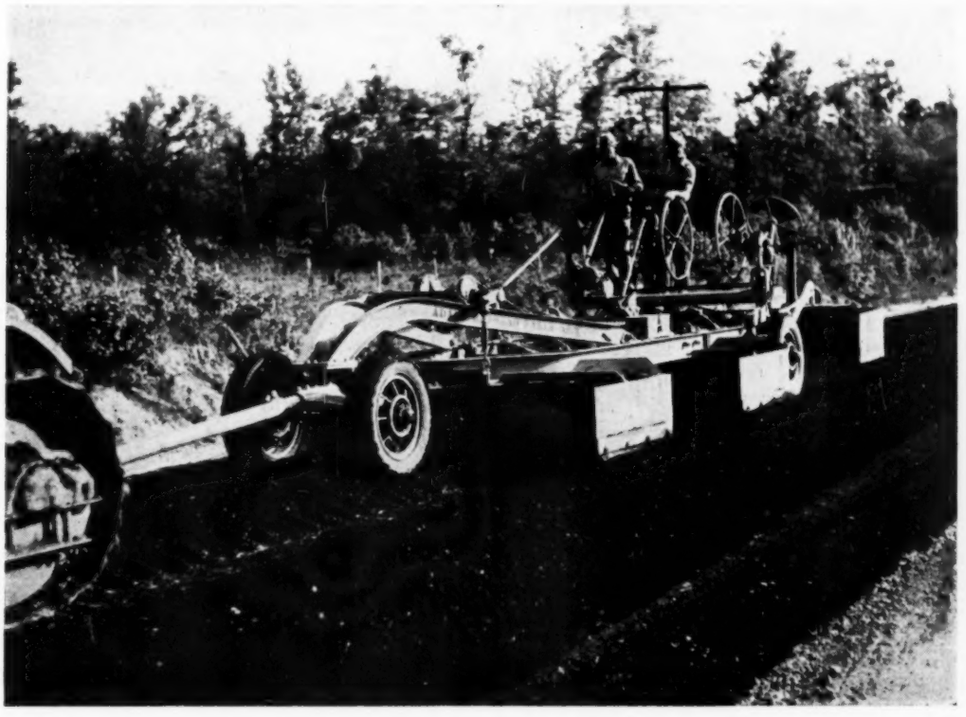
Asphalt Road-Mix Surfaces

Very substantial mileages have been constructed of the road-mix type during the past year, but with relatively few changes from methods previously described. One modification is to be noted in regard to the dense graded road-mix, which is for the same reason discussed under primers in a previous paragraph. Early recommendations for dense grade aggregate called for the MC-2 grade of kerosene cutback asphalt as binder and from 8 to 14 per cent of 200 mesh mineral filler. As a result of experimental construction, it has been found that with glacial gravels or crusher-run stone containing little or

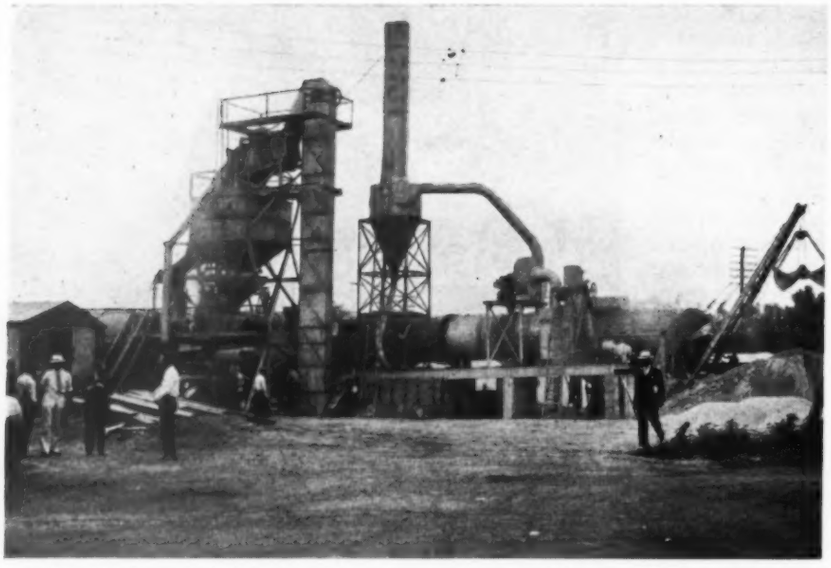
Ohio: Special Road-Mix Machine with Pug Mixer, Producing Dense Mixtures with a Single Pass.

no 200 mesh material, entirely satisfactory mixtures will be obtained through use of higher viscosity asphaltic materials. MC-3 is therefore recommended for use where little or no 200 mesh material is present in dense graded road-mix construction.

Experience has added further to knowledge concerning behavior of various kinds of coarse aggregate in road-mix surfaces, particular in respect to their absorptive character. It is not always possible to determine from the screen analysis alone just the type of bituminous material to be used, and with soft chalky limestone or very absorptive stone of any character it is often better to use an MC product rather than an RC product, because either the dust on the stone or the stone itself will rapidly absorb the distillate, thus setting up the MC product, while with a non-absorptive stone a rapid curing asphalt would be required. There is a further advantage in using the MC products with soft aggregates, because the latter tend to break under traffic, and with the soft asphalt residue present there is a rehealing action which does not obtain with hard asphalts.



Arkansas: Retread Paver at Work on Dense Graded Aggregate Road-Mix Job on U. S. 167



Ohio: Modern Asphalt Plant Preparing Asphalt T-135 for Resurfacing of U. S. 40, West of Cambridge.

Asphalt Plant-Mix

For plant-mix operations a number of important items are to be noted. First, there is the more exact plant control which makes for greater uniformity of mixtures as delivered to the truck. Many old plants have been reconstructed during the past year so that more positive control of proportioning of constituents and percentages of aggregate and asphalt in the batch are obtained. Mention has been made of the more careful choice of asphaltic materials according to the character of aggregates in surface treatment and road-mix work, and in plant-mix operations still more study is being given to aggregates and their preferential affinity for asphalt or moisture. There can be no doubt that unsatisfactory results often have been attributed to the asphalt, to the plant, or to the work on the street or road, when the fundamental trouble was with the aggregate itself. It cannot be too strongly urged that careful laboratory studies be made in respect to the behavior of aggregates in bituminous mixtures before adopting a design for any particular mixture. As a result of such studies aggregates which might cause trouble are susceptible to treatments which will overcome all difficulty.

There is still room for much improvement in many specifications for hot-mix surfacing, and the first one recommended for inclusion in all highway work, at least under conditions where proper equipment may be used, is that the tolerance for surface smoothness should not exceed ⅛ in. in 10 ft. It is entirely possible to obtain this kind of work and it should be required. The use of 9-in. steel side forms is recommended for both resurfacing and widening operations or for new paving where hot mixtures are used. In the first place, such forms are widely available and may be easily set regardless of the thickness of the new surface. They provide the solid support required for operation of the mechanical finisher, and once set to the finished grade can be used for construction of the base and wearing course, or in widening work for the base, leveling, and wearing courses. Their use considerably simplifies base course operations and as they are solid and substantial they give the support required in order to obtain the surface smoothness above mentioned. As a rule, surface courses should be placed in two layers—the coarser mixture underneath and the fine textured finish as a wearing surface wherever aggregates have a high coefficient of friction. This is particularly true in asphaltic concrete design.

A new development, and with much to commend it, is the practice of adding a seal coat to a sheet asphalt surface when laid on a country highway having high speed traffic. This is standard practice in several states and adds remarkably to the appearance of the surface as well as adding a definite non-skid quality wherever there is danger of carrying mud on the surface of the pavement. The seal coat usually consists of 0.25 gallon RC-3 asphalt per sq. yd. covered with ½-in. crushed aggregate.

Trends

The trend toward plant-mixing appears to continue although one notable exception is to be made in the use of a special road-mix machine having a pug-mill in front of the multiple blades. With this machine it is possible to mix coarse and fine aggregate with rapid-setting liquid asphalts so that a surface similar to asphaltic concrete is almost immediately available. Excellent results have been achieved with this machine and there are many areas where it will be more economical than a plant-mix. Asphalt plants, especially for cold mixtures, are being established so widely, however, that with the volume of business anywhere near capacity it is possible to turn out well-controlled mixtures at costs little if any above road-mixing. In fact, in many states all patching material is purchased from such plants because it can be delivered immediately at any desired point at prices but little if any above that obtained by hand mixing on the job.

There is evidence of greater dependence upon laboratory studies for all types of asphalt work, whether in soil stabilization or in high type hot mixtures. Variations in behavior long accepted as inevitable are now yielding to exact analysis of aggregate and asphalt behavior. Whether an aggregate is water-repellent or water-absorbent in the presence of asphalt is of great importance and should be determined prior to use. This absorption may vary a great deal between aggregates having identically the same sieve analysis and which will therefore behave differently with the same bituminous materials. That day is past when the builder could pick up a handful of aggregate or smell a sample of bituminous material and off-hand pass upon its correct use. It is now a matter for exact laboratory analysis, then intelligent design, and finally the more complete utilization of the superb mechanical equipment available today for mixing, placing and compacting. With such knowledge and equipment at hand there is little excuse for not placing pavements of the highest durability and of maximum smoothness.

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We Admit We Build 'Em Right

A mountain man, who rarely, if ever, visted a town of any size, came to a city with his son, traveling in a rattletrap car.

Climbing out on one of the main streets, the old man appeared fascinated by the pavement. He scraped his feet on the hard surface, and, turning to his son, remarked:

"Well, I don't blame 'em for building a town here. The ground is too darn hard to plough, anyhow."—*Excavating Engineer.*

CURRENT RESEARCH IN BRICK AS A PAVING MATERIAL

By GEO. F. SCHLESINGER
Engineer-Director
National Paving Brick Association.

FOREWORD For a number of years the National Paving Brick Association has maintained a Research Bureau at the Ohio State University Experiment Station in Columbus, Ohio. The work of the Bureau is under the general supervision of Dr. G. A. Bole, Research Professor at the Ohio State Experiment Station, and Mr. H. Z. Schofield, Ceramic Engineer, is in direct charge.

Fillers

A prominent part of the work of the Research Bureau of the National Paving Brick Association has been concerned with paving brick joint fillers. Consideration has been given to cement grouts, bituminized cement grouts, plasticized sulphurs and bituminous fillers. Among the bituminous fillers, comparisons have been made between asphalts from different base crudes, asphalts of different softening point and penetration, asphalt mastics and straight pitches and pitch mastics. In the laboratory the properties and behavior of the fillers were observed and interpreted in terms of practicability. Special emphasis was given to a test wherein the exuding or receding tendencies of the bituminous fillers were observed by subjecting filled brick panels (of about one square yard area) to prolonged periods of simulated summer temperatures. From these tests a number of fillers were selected as worthy of actual pavement trial.

In cooperation with the Ohio Department of Highways, a project was planned and completed (November, 1935) in which the entire length of one and one-quarter miles of new brick pavement on Ohio Route 31 in Hocking County, Ohio, was allotted to a test of fillers. Of these fillers thirteen are in sections exceeding 300 feet in length and eight in sections somewhat shorter. During construction, observations were made to determine the practicability of application, including the surface removal of the fillers. Since completion of the pavement thorough inspections of the fillers under service have been made periodically. While this pavement has been in service but a little more than one year, the weather experienced has been exceptionally severe. During the winter, maintained periods of sub-zero weather were undergone. The past summer, being of exceptional warmth, was featured by one period during which on six consecutive days the temperature exceeded 100° F. This severity of weather and its resulting effect on some of the fillers would indicate that conditions at this time, while possibly not conclusive, should be of considerable value.

LONGITUDINAL BRICK PROJECT
Making special closure at infrequent transition points because of change in number of rows.

The Ohio Highway Department, basing its selection on satisfactory behavior in the test road to date, has designated four of the fillers for more extended use and further trial in brick pavement projects. These four fillers can be described in general terms as follows:

(1) A "blended" asphalt, being 65 per cent mid-continent base and 35 per cent asphaltic base; penetration at 25° C. of 23 to 32; softening point 101-110° C.

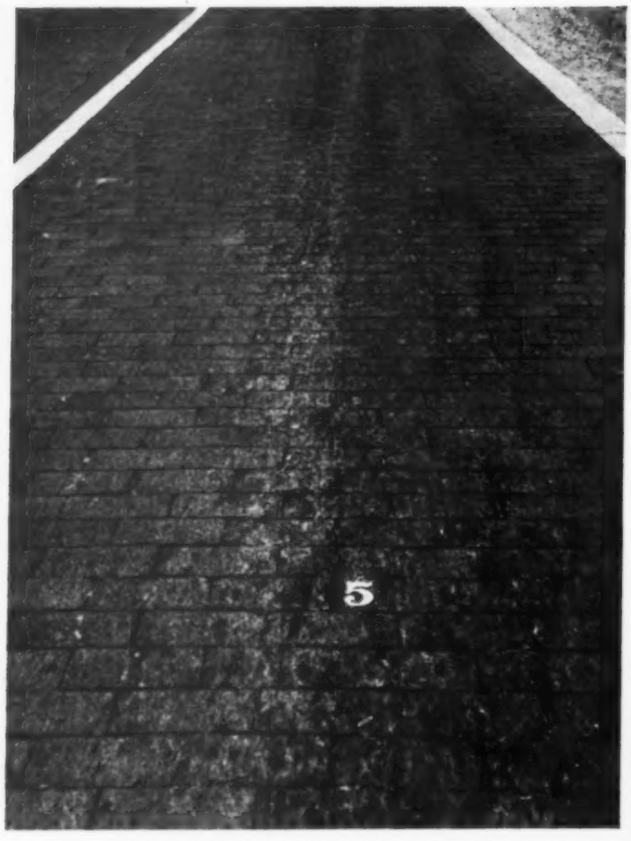
(2) A blended asphalt very similar to the above, with 20 to 30 per cent finely divided mineral content; penetration at 25° C. of 17 to 26; softening point 107-116° C.

(3) A special coal tar pitch; penetration at 25° C. of 35 to 65; softening point 60-75° C.

(4) A plasticized sulphur-asphalt mixture with sulphur content 38 to 42 per cent; penetration at 25° C. of 28-34; softening point 65-75° C.

Temperature Gradient

During the construction of this pavement there were permanently installed seventeen copper vs. constantan thermocouples to permit the periodic taking of temperatures in the brick, filler, cushion, concrete base top, base bottom, sub-grade and sub-berm. Temperature readings taken in both winter and summer indicate that, while the temperature of the brick surface course fluctuates rapidly with weather changes, these fluctuations are transmitted to the underlying base in a lesser amount, the difference being of the order of 20 to 25° F. during maximum and minimum periods, and extend over a longer period so that the rate of change is much lowered. While it long has been assumed that a concrete base is "protected" against temperatures extremes by a brick surface course, definite and quantitative data are now available which can be considered in base course design. Also, of interest in filler study, it has been found that under a direct sun the temperature of brick and filler exceed the air temperature, in one case the filler temperature being 121° F., while the air temperature (shade) was but

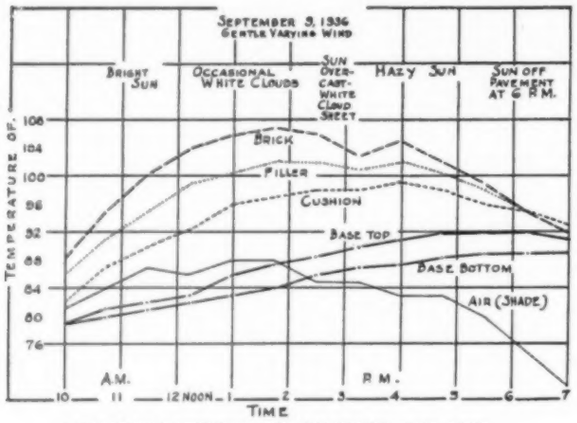


FILLER TEST ROAD (After One Year)
Section showing mineral filled blended asphalt filler with well sealed joints and no exuding.

97° F. The temperature of the cushion or bed was a mean of the brick and base temperatures. Over the one-year period the range of the sub-grade 30 in. below the pavement extended from a minimum temperature of 28° F. to a maximum temperature of 82° F., this range being expanded for the lesser depths.

Longitudinal Laying

In December, 1936, the Ohio Highway Department completed the construction of another section of new brick pavement on the same route and a short distance from the filler test road in which the usual construction procedure was followed, with the exception that the brick were laid *longitudinally*—that is, with the 8½-inch



TEMPERATURE GRADIENT CHART
Showing typical variations in temperature of a brick pavement structure.

dimension parallel with the curbs. It is a Federal aid project 1.353 miles long, 20 ft. wide over-all, with 3-in. fiber lug brick on a concrete base, with 9-in. integral curbs, using standard asphalt filler. Periodic observations will be made on this section, after completion, to note the effect, if any, on the brick units, the filler behavior and the riding qualities of the pavement. One specific item of interest will be an observation on the ability of brick in this position to span transverse base cracks, especially those at contraction joints which were placed in the concrete base.

In the construction of this project it was necessary, at infrequent intervals, to vary the number of longitudinal rows (4 in. wide) between 52 and 54. This was due to the variation in the distance between inside curb faces and width of the brick units within permissible tolerances. The only batting or cutting of brick for closures was at these transition joints.

Continuous longitudinal joints such as exist on this pavement were of evident disadvantage when traffic was

FILLER TEST ROAD (After One Year)
Close-up of brick pavement with plasticized sulphur-asphalt filler, showing no exuding or receding.

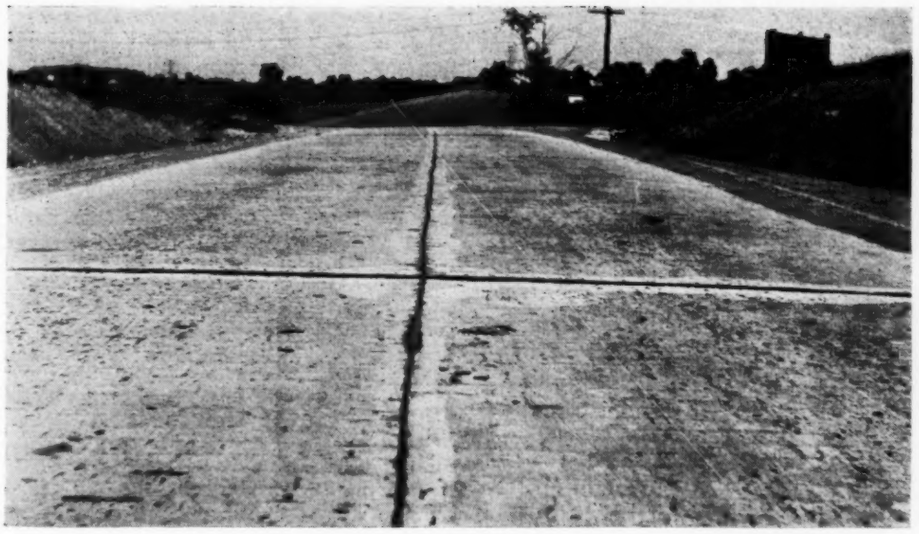
predominantly of the steel-tired type. This experiment may reveal that with modern traffic, objections to this method of laying are a relic of the "horse and buggy" days.

Carroll County, Ohio, Test Road

This project is located just north of Carrollton on State Route 43, and was constructed by the Ohio Highway Department in 1933 for the purpose of comparing different types of brick pavement design rather than experimental fillers as in the Hocking County road. It is a little over three miles long and is divided into ten sections. Three types of brick surfaces, monolithic, grout

TEST ROAD ON OHIO ROUTE 43 IN CARROLL COUNTY

View of monolithic section when constructed in 1933, showing longitudinal and transverse joints.



filled and bituminous filled, were built. In addition several other special construction features were built as subsections, which are briefly described as follows:

There are three types of base—first, the monolithic type base with transverse expansion joints and no contraction joints; second, the 6-in. concrete base under the grout filled pavement with transverse expansion joints and no contraction joins; and third, the 6-in. concrete base under the bituminous filled sections with transverse contraction joints and no expansion joints. Three kinds of cushion were used, mastic, sand-cement and granulated slag.

FILLER TEST ROAD (After One Year)
Standard asphalt filler showing exuding accentuated over weakened plane joint in concrete base.

In a report presented at the 16th Annual Meeting of the Highway Research Board (1936), R. R. Litehiser, Chief Engineer of Tests of the Ohio Department of Highways, made the following brief summary of the outstanding developments on this test road.

1. The monolithic sections are still in good condition, showing only one failure in slabs and one in joints.
2. Transverse cracking in the grout filled sections, previously reported to have consisted of one crack in each 100-ft. slab, has increased to two cracks in some cases.
3. Excessive exuded filler is still prevalent on all bituminous filled sections.
4. Expansion joint failure is increasing in the grout filled sections. This is due to poor alignment of the base joints with the brick joints.
5. More evidence of cushion displacement was noted on sections with granulated slag.

All-Brick Pavement

A laboratory investigation is being conducted on the use of reinforced brick slabs for all-brick road construction. Tests are conducted with the view of placing directly on a well drained sub-grade the cement grouted brick units reinforced with transverse steel rods. Initial tests formed a comparison between reinforced type slabs in which the efficiency of the tension steel is dependent on the steel-grout bond, and the "flat-arch" type, in which the steel-grout bond consideration is eliminated by "staying" the rods with nuts and channels at the curbs. Results of this comparison have shown the advisability of the use of "flat-arch" type slabs. The steel rods are placed at the center of the slab depth so that the slab is equally efficient for sub-grade support at the ends with center loading and sub-grade support at the center with edge loadings. Consideration at present is being given to brick unit size (units used in these tests are 8½ in. x 8½ in. and 4 in. thick), desirable grouts and necessary steel. Thus far slabs of 4-in. depth have been constructed, which will support a center load of 5000 lb. over a 5-ft. span (30 in. width).

De-airing Study

With the advent of the method of producing paving brick by the evacuating or de-airing process, the question of whether new standardized tests are advisable has arisen. Last year a cooperative study of de-aired paving brick was begun and participated in jointly by the Federal Bureau of Public Roads and the Research Bureau

LONGITUDINAL BRICK PROJECT

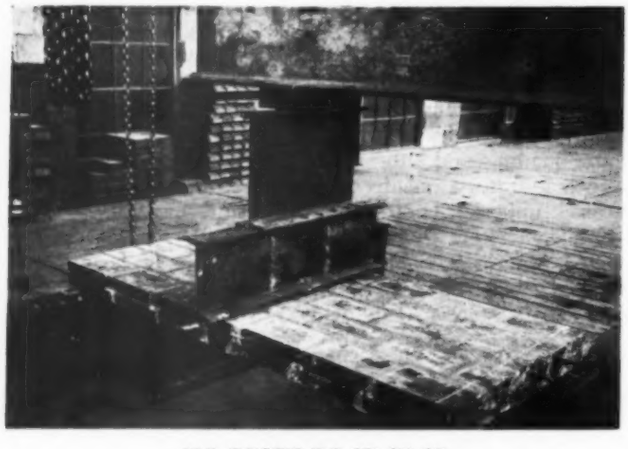
Laying brick on mastic cushion on Federal-State test road completed in December, 1936, on Ohio Route 31.

of the National Paving Brick Association. This investigation is still incomplete, and its progress has been postponed for the present, principally because, although the study has shown that de-airing will produce a unit with improved physical properties, this method has not yet attained its ultimate stage as a manufacturing process. The investigation in general embraces a comprehensive comparison of the qualities of both de-aired and unde-aired brick from nine plants located in Pennsylvania, Ohio, Indiana and Illinois. Samples representing each of three degrees of burning (dark, medium and light), from both de-aired and unde-aired stock, have been selected from each plant. Future tests will reveal the progress that has been made in adapting the process to various types of raw materials so as to produce optimum results.

Compression Test Methods

While a standard procedure for the testing of paving brick under compression has not been adopted, the determination of this property is often desired. In conducting compression tests on other structural clay products the standard procedure of the American Society for Testing Materials involves the capping of specimens with plaster-of-Paris. Before adopting this procedure for paving brick it was thought advisable to learn the true strength of the units. For this determination paving brick halves were given polished bearing surfaces by grinding on a steel lap, and centered between two polished tool steel bearing plates before crushing. In a direct comparison, this polished face method gave compression strength values from 60 to 100 per cent greater than the values by plaster-of-Paris capping (in many cases results by the polished face method exceeded 30,000 lb. per sq. in.). A direct comparison on brick was conducted also between plaster-of-Paris capping and sulphur-sand capping (a mixture of sulphur and windblown sand applied while molten), the latter giving strength results 20 to 30 per cent higher than plaster-of-Paris capping.

While the polished face method was used to obtain a true basis of comparison, the procedure is wholly practical as a laboratory test. A close study of all results indicates that sulphur-sand capping is superior to plaster of Paris capping.



ALL-BRICK ROAD SLAB

Laboratory test of flat arch type of reinforced brick road slab at the Research Bureau of the National Paving Brick Association.

Miscellaneous Studies

With the thought ever present of improving the paving brick unit wherever possible, microscopic observations are being made on the internal structure of paving brick manufactured with various degrees of vacuum. It is hoped that, by this means, a correlation between serviceability and body structure (glass content, grain size, etc.) will be found. With serviceability known in terms of structure, improvement by control of manufacture can be much more intelligent.

Tests are also planned to determine the adhesive qualities of various filler materials under different conditions of temperature and moisture. Also an investigation is under way of the progressive abrasion loss during the standard rattler test, by determining the loss at the end of a successive number of revolutions. The loss-revolution curves for brick of various degrees of burning it is believed will be useful in manufacturing control.

Conclusion

As has been indicated, the objectives of research will fall into two general classifications. First, is an endeavor to further improve the product itself by devising more accurate methods of controlling and checking the manufacturing process. Although paving brick can make claim to being the oldest manufactured paving material, and has had a history of continuous successful utilization in this country during the past two-thirds of a century, the industry, through its national trade association, is not content to accept the status quo. If paving brick can be made even more valuable to the user, the demand for it will be increased and extended. In other words, research pays its way. Second, is the "searching out" of methods to improve the utilization of the product. In the case of paving brick, this is of extreme importance as, in the pavement, the brick units are surrounded and supported by a number of other construction materials. The excellence of the paving structure as a whole depends to a large degree upon the quality and proper use of the other materials used in conjunction with the principal item in the design—vitrified paving brick.

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A Suggested Method of Sealing Out Water from Pits and Other Excavations

Inasmuch as bentonite has the property of absorbing five times its weight of water, and swelling enormously in the process to as much as fifteen times its bulk, it is being used to prevent water seepage, says *Mineral Trade Notes.* Pressure grouting with a bentonite slurry through drill holes encircling a shaft or open pit has attractive possibilities.

DEVELOPMENTS IN THE DESIGN AND CONSTRUCTION OF CONCRETE PAVEMENTS

By LEO M. ARMS
Highways and Municipal Bureau,
Portland Cement Association

CONCRETE pavement design and construction is in a constantly advancing state of development. But changes are gradual so that it is difficult to say exactly when and where they occurred. Research projects are undertaken in one part of the country and, if the results are successful, the new development spreads until its use is general. The complete adoption may require several years.

In this respect the past year was no exception. There were innovations which may in time become standard practice. At the same time some experiments of earlier years were gaining increased acceptance.

The separation of roadways resulting from the New Jersey slab moving project is made more effective by use of white concrete curbs

Joints

The design and construction of the various types of joints continue to receive much attention. The practice of using expansion joints at fairly long spacing with simple and less expensive contraction joints intervening at shorter intervals has become standard practice in many states. Control of cracking is accomplished at a cost much less than where expansion joints alone are used.

A number of new load transfer devices for the strengthening of slab ends were offered and there were further developments in the design and use of the older types. The Bureau of Public Roads has given its tentative approval to a greater spacing of dowels under conditions which assure better alignment and bearing of the dowels.

Tests of load transfer devices are reported from the state highway departments of Kansas, Indiana, Michigan, New York, New Jersey and Illinois. The studies included the use of shorter dowels, dowel sockets or anchors, pipe dowels, structural shapes as well as complete new joint assemblies or variations of older assemblies. Several of the tests indicated that the new devices had important advantages which may bring them into increased use.

In order to insure the accurate placement of dowels there is a growing use of dowel holders or complete dowel assemblies which are placed as a unit and which remain in the pavement. The slightly greater first cost is more or less offset by ease of installation.

It is of utmost importance that there be no honeycombed concrete adjacent the joint or around the dowels. To avoid that possibility, spading or vibration is specified at the joints. Several types of portable vibrators are available.

In the hinged longitudinal center joint, there is a definite trend toward the use of shorter tie bars at smaller intervals. In place of ½-in. by 4-ft. bars at 5-ft. spacing which was formerly a standard practice, deformed ½-in. tie bars as short as 2 ft. at 2½-ft. spacing are now being used. The same amount of steel ties the

Vibration is frequently used to insure good bearing and freedom from honeycomb around joints and dowels

two halves of the slab more firmly together and results in a stronger slab adjacent to the joint.

There is a continued trend toward the use of non-extrusive fillers for expansion joints. Search for satisfactory sealing material has brought several new products into the field. On a project in Indiana 23 different combinations of load transfer devices, joint fillers and seals were recently installed for observation and test. From this and similar studies, standard designs for future years may result.

Equipment

The approach of more nearly normal labor conditions has renewed interest in new equipment for concrete road construction.

Vibratory methods of placing and finishing concrete are coming more into use. Experimental use of vibration was made in several states, and vibration was specified for the first time, in Illinois, on a routine paving construction project. A careful watch was kept to get data on the effect on cost, and to observe the results on a job constructed under more normal conditions than those existing on an experimental project.

The Illinois road made use of vibrators attached to a screed of the finishing machine, the concrete being placed in the usual manner.

Another type of vibrating equipment being developed is one in which the concrete from the mixer is discharged into a hopper or trough which is part of the finishing machine. From this hopper the concrete is vibrated as it is fed into place in the pavement. This type of machine has been used experimentally to place concrete with as little as 20 gallons of water per cu. yd. of concrete. Machines of this type are still in an experimental stage and have not yet been placed on the market.

Another machine designed to further improve the riding qualities of concrete pavements is the power-operated longitudinal float. A 10-ft. longitudinal float, or screed, is supported by a wheeled framework which rides the forms. The screed moves across the slab with a combined longitudinal and transverse movement, being supported so that it conforms to the desired shape of crown and irons out longitudinal irregularities. As the screed moves from one side to the other the whole machine may be set to remain stationary or to move forward about one-half the length of the screed. The movement of the screed is automatically reversed at each edge of the pavement. This machine was used experimentally in 1935 and was placed on the market in 1936.

The tendency to use heavier finishing machines makes it more important than ever that forms be firmly supported. A new form-tamping machine rides on the forms and tamps the soil under the form from each side. The result is that they will not be depressed and a truer pavement surface will be produced.

A new form-grading and subgrading machine cuts a cross-section of any required shape from a rough grade which was intentionally left slightly high. The rough grading need not be so accurately done, yet the fine grading is more easily and accurately completed than was heretofore possible, resulting in a further economy in the construction of a high type pavement.

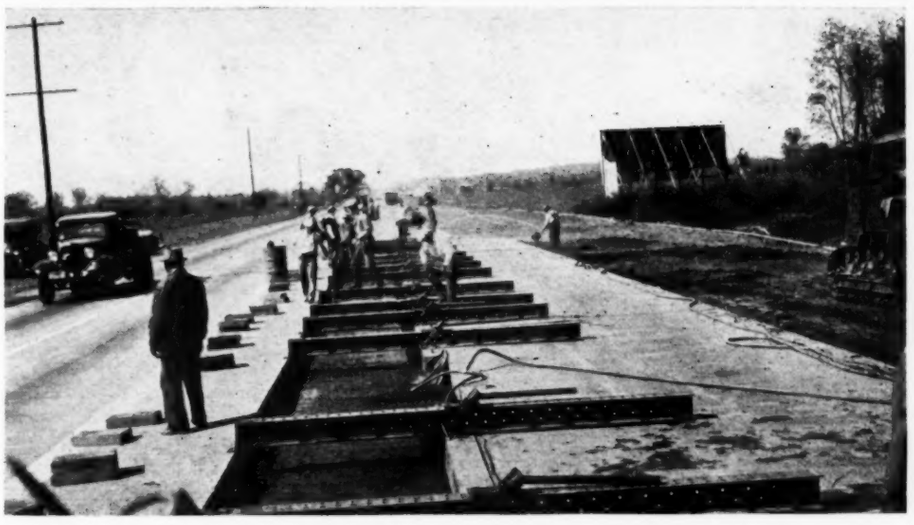
Dual drum mixers, which are now offered by equipment manufacturers, accomplish with one machine the same result which was formerly attained by two mixers operating in tandem. A study in New Jersey indicates that an important increase in rate of production resulted from their use.

Concrete

In order to obtain maximum benefit of the vibratory method of placing and finishing concrete it is necessary to use a drier mix and to introduce more coarse aggregate into the mixture. This requires a better and more uniform grading which can best be obtained by supplying the coarse aggregate in two or more sizes, each of which is weighed separately for each batch. Although this practice becomes of greater importance when vibration is used, it has economical advantages with ordinary finishing methods and its use is increasing. An investigation shows that 19 state highway specifications now require the coarse aggregate to be handled and weighed in two or more sizes.

Proportioning by weight is now almost universal although there is considerable variation in the method of determining proportions. Most states are using fixed proportions of one type or another but some are designing mixtures by the water-cement ratio, void-cement ratios or by absolute volume methods. Of the fixed proportions, the one that gives weight of material to be used per sack of cement for various specific gravities of the aggregate seems to be gaining in favor. Probably the method that fixes the absolute volume of mixed

Economy resulting from the use of dry mixtures containing increased amounts of coarse aggregate is made possible by vibratory methods of finishing



New Jersey has practically and economically moved concrete slabs to form separate roadways on 6.2 miles of U. S. Route 1. Extension of this mileage is planned

aggregate per absolute volume of cement has the greatest number of advantages of any of the fixed proportions.

Design

Current tendencies in the design of concrete highways show that safety is being given the place of first importance. Where traffic is heavy, separated roadways are being provided. Nation-wide attention has been attracted to the slab moving project in New Jersey where an old concrete road was split into separated roadways by jacking one slab over to a new position, leaving a 10-ft. space between it and the other roadway. Only on a rigid pavement such as concrete is this sort of an operation possible. Started in 1935 the first project of 6.2 miles was completed in 1936 and plans are prepared for continuing the operation for a distance of 4.68 miles.

The tendency of states to use slabs designed for traffic loads and subgrade conditions is evidenced by 21 states having two or more standard cross-sections from which they select one satisfactory for conditions existing on each project. The traffic studies which most of the states are now making in co-operation with the U. S. Bureau of Public Roads will supply information on existing and anticipated traffic loads and make possible even more accurate design of slabs for anticipated traffic. Past research has supplied engineers with much data on which to design concrete pavement slabs for different conditions of loading and subgrade. During the past year these data have been supplemented by the publication of a series of reports on research into concrete pavement stresses which the Bureau of Public Roads hase been carrying on over a period of years.

Safety is of first importance in concrete highway design. The Sunrise Highway Extension on Long Island is made safer by separating the roadways

Curing

The cotton marketing division of the AAA early in 1936 announced that 80,000 cotton mats would be purchased and offered to the state highway departments for experimental projects to demonstrate their efficiency and economy in curing concrete pavements, the purpose being to encourage the use of cotton in highway construction. The response by state highway departments was enthusiastic. They requested 89,500 mats, enough to cure over 82,000,000 sq. yd. of concrete pavement if each mat can be used 75 times as indicated in a Texas test reported in *American Highways,* July, 1935, a pubtest reported in American Highways, July, 1935, a publication of the American Association of State Highway Officials. This test and tests conducted by the Bureau of Public Roads indicate that wetted cotton mats constitute an excellent curing material, effectively retaining the moisture which the concrete requires and protecting it from both high and low temperature extremes during the early hardening period. Their economy and effectiveness indicate a more general use in coming years.

The use of reinforced waterproof paper for curing is also increasing in popularity.

Subgrade

Considerable progress has been made in the study of certain adverse subgrade soils and the application of these studies to the production of uniform and stable subgrades under concrete pavements in order to maintain their good riding qualities. Both Texas and Kansas have built concrete test roads in which various treatments of these adverse subgrades were used to determine the best method of maintaining a volume constant subgrade. The tests included the use of granular admixtures, water treatment and protective membranes, all of which are designed to eliminate the volume change characteristics of the soil or to protect it from changes in moisture content and the resultant change in volume. While the investigations are not yet completed, good re-

Concrete footpaths improve safety conditions near cities. They provide a good opportunity for profitable use of WPA labor

sults appear to be obtained most practically and economically by water treating the subgrade to establish an optimum moisture content previous to pavement operations.

Resurfacing

While concrete resurfacing has been used in the past, its field of use will materially increase as old pavements now in service need modernization. Frequently resurfacing will be carried out in conjunction with widening operations. Considerable information is now available from studies of concrete resurfacing projects in service up to 25 years in various locations. To obtain further information on the best practice in jointing and widening, a project in Cook County, Illinois, was resurfaced and widened, varying the construction details every five hundred feet. From observations of this project the Cook County Highway Department expect to get much guidance for future work.

Concrete Pedestrian Walkways

The high rate of pedestrian fatalities on rural highways and the current intense interest in safety measures are bringing about the construction of long-needed pedestrian walkways in suburban areas.

It has been claimed that pedestrians will not use footpaths even if they are provided for them. Experience in cities shows how little basis there is for that claim. Mr. R. E. Toms, Chief of Division of Design, U. S. Bureau of Public Roads, has well expressed the situation as follows:

> "Where there is an appreciable amount of pedestrian traffic, sidewalks must be provided as an adjunct of highway design. They preferably should be located beyond the roadway ditch and must have a surface equally as good or better than the roadway along which they are built or they will not be used by those they were intended to serve. The ordinary individual will chance the hazard of walking on a paved road rather than walking with safety on a loose gravel walkway."

Still another reason why pedestrian walkways have received considerable attention during the past year is their adaptability to WPA construction. During the past year, as an example, Nassau County, adjacent the Borough of Queens on Long Island, has built concrete paths along some 200 miles of the important traffic routes through that suburban area. The work was done by the WPA, the county furnishing the equipment, trucks and part of the materials. The county share of the cost amounted to about 25 per cent of the total.

Sectional Plate Arch Used as Storm Sewer Enclosure

Recently in the city of Cleveland, O., an unusual and interesting installation of a Toncan iron sectional plate arch was made—as a storm sewer enclosure.

Dugway Brook, located in the northeast side of Cleveland, has long been a sore spot to near-by residents, particularly in the summer time. Its fumes and water have been anything but an asset to the beautiful parkway through which it flows. This year, with Works Progress Administration money, the city of Cleveland drew up plans to correct this eyesore, and shortly after, actual work began at Dugway Brook. The total length of the project was 1,800 lin. ft. A 3-gauge sectional plate arch having a span of 17 ft. and a rise of 7 ft., was used.

The thing that made the Dugway Brook installation unusual, was the fact that it twists and turns its way to Lake Erie, its bed winding in and around the park. It was decided to have all the sections of sectional plate arch, which would cover the bends in the stream, set up in the mill, and welded to specifications. After this was done, the arch was then dismantled in sections and delivered to the job. By doing this, the sectional plates covering the turns of the stream were easily transported and easily handled which resulted in the simple and accurate construction of the arch at the installation site.

Later on, it is planned to place a 3-ft. fill over the arch and landscape it in keeping with the park through which it flows.

Installation of Sectional Plate Arch Over Dugway Brook, Cleveland, O.

THE USE OF ROAD TARS IN 1936

By GEO. E. MARTIN
Consulting Engineer,
General Tarvia Department,
The Barrett Company

A Tar Re-Tread in Tennessee

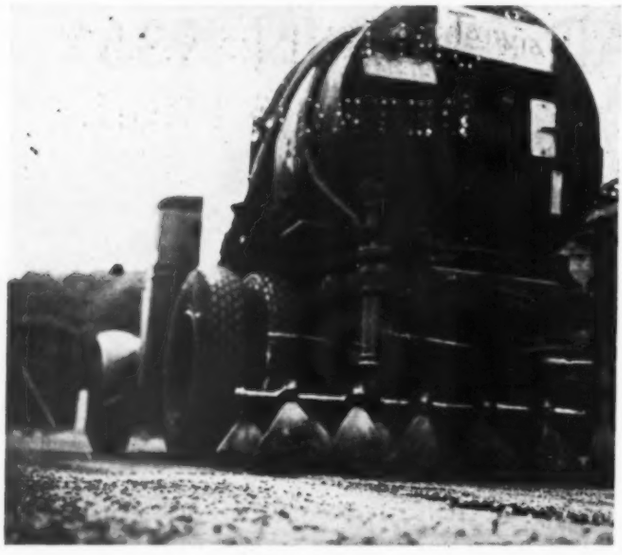
TARS were extensively used in all of the old standard methods in 1936 and some new and improved methods of use were developed. The older methods were modified slightly to meet the requirements of changing conditions.

Technical Specifications

New and improved tar specifications were considered during the year by committees of the American Society for Testing Materials and the American Association of State Highway Officials. The advent of heavy water gas tar with its higher free carbon content has encouraged the preparation of combined specifications under which either coal tar or water gas tar may be furnished. The new specifications now under consideration are of that type.

A more logical list of tar grades has been proposed in the A. A. S. H. O. specification. All of the tar consistencies have been covered in twelve grades and there are no consistencies not covered by one of the proposed grades. The grades are as follows:

Grade	Test Method	Test Value	Use
RT- 1	Specific Viscosity, Engler at 40°C	5-8	Prime Coat
RT- 2	Specific Viscosity, Engler at 40°C	8-13	
RT- 3	Specific Viscosity, Engler at 40°C	13-22	Prime Coat and Surface Treatment
RT- 4	Specific Viscosity, Engler at 40°C	22-35	
RT- 5	Specific Viscosity, Engler at 50°C	17-26	Surface Treatment and Re-Tread
RT- 6	Specific Viscosity, Engler at 50°C	26-40	
RT- 7	Float Test at 32°C, Seconds	50-80	Surface Treatment, Pre-mix, Re-Tread, and Seal Coat
RT- 8	Float Test at 32°C, Seconds	80-120	
RT- 9	Float Test at 32°C, Seconds	120-200	
RT-10	Float Test at 50°C, Seconds	75-100	Pre-mix, Seal Coat, Penetration and Crack Filler
RT-11	Float Test at 50°C, Seconds	100-150	
RT-12	Float Test at 50°C, Seconds	150-220	



Applying Tar

In addition there are two grades of cold patch tar TCB-5 and TCB-6, with specific viscosities, Engler, at 50 C. of 17-26 and 26-40 respectively.

Penetration Macadam

Tar penetration macadam was used extensively in New York City and other localities for new street construction as well as the re-surfacing of existing streets. In some instances two layers of penetration macadam were built over a macadam base. The tendency is to use two seal coats and thoroughly close the surface voids so as to hold the final seal coat on the surface of the road.

The new specifications for aggregate gradings issued by the U. S. Bureau of Standards have not been extensively adopted as yet, but should result in greatly improved work when aggregates produced under them are generally used.

Re-Tread

Re-tread continues to be a favorite resurfacing method. Almost every existing type of pavement has been given a new wearing surface by the application of a new re-tread top during 1936. The practice is to use as heavy tar as can be readily handled on the road. Heavier and better mixing machinery has made possible the use of the heavier grades. RT-5 and RT-8 are generally used for re-tread, the choice depending upon seasonal and climatic conditions, and the type of mixing machinery available.

Two seal coats are now standard practice and every effort is made to thoroughly fill the surface voids so that a tight impervious surface is obtained.

On some city work the final seal coat has been applied without cover so that there is no loose material on the surface when the job is finished.

Gravel Treatments

While a large mileage of gravel roads have been treated by the usual surface treatment methods, the tendency seems to be to use the mulch method, and thus obtain a greater depth of coated gravel.

Loose gravel depths of from one to 4 in. are mixed on the road surface with tar. Here again the tendency has been to use the heavier tars wherever possible. Grades RT-4 to RT-6 are commonly used, the choice for any particular project depending upon the grading of the gravel, climatic and weather conditions, and the type of mixing machinery available.

Some experimental work has been done using a light tar mixed with gravel containing a large percentage of fine material. An application of from one to 2 lb. per sq. yd. of powdered pitch was then applied and mixed with the tar coated gravel to stiffen the tar and cause it to set quickly.

All gravel mixes should be sealed. It is good practice to delay the seal coat until the entire job is finished or even longer, but it should not be omitted except when the work is completed very late in the fall.

Cities and villages have discovered that excellent tar treated gravel streets can be built at a very low cost. There is no longer any excuse for dusty, dirty, muddy street surfaces.

Chemically Stabilized Gravel

Tars have been used to an increased extent to protect the surface of gravel bases stabilized by the use of calcium chloride or sodium chloride. The surface to be treated should be graded smooth before the tar is applied.

A prime coat of RT-2 is generally used. Ordinarily ¼ gallon per sq. yd. is used, although sometimes the road will not absorb that much.

A seal coat of a heavier tar, RT-8 or RT-9, at the rate of ⅓ gallon per sq. yd. is needed with a slag or stone chip or pea gravel cover. The cover is rolled into the tar to complete the job.

Comparatively thin gravel mulches and dragged surface treatment have also been used over the chemically stabilized bases with excellent results.

Mixing Tar and Gravel in Ohio

Tar Surface Treatment, Coolemee, North Carolina

Dragging Sand-Tar Mix on Runways, Savannah, Georgia, Airport

There seems to be an increasing tendency to consider chemically stabilized gravel as an excellent base or foundation which must be protected by a water-proof top which will take the wear and abrasion of traffic. Combinations of tar and aggregate are eminently satisfactory for this purpose.

Airport Surfaces

More paved run-ways and other traffic areas have been built in 1936 because of the increased WPA funds.

All standard types of tar construction have been used. Precautions have been taken to not have loose aggregate on surfaces where airplanes are operated on the ground.

In the southern coastal section excellent runways have been built using a combination of tar and sand mixed in place on the surface. About 5 per cent of tar has been used in the mix using an RT-7 tar. A compacted thickness of about 6 in. for runways has usually been considered satisfactory.

Concrete Maintenance

The maintenance of cracks and joints in concrete by means of a plastic tar, applied through a pressure gun, has increased in favor during the year. The cracks and joints can be filled in the fall and will require no further attention for at least a year, and in many cases for several years. The method of application is simple and the work can be done by the ordinary labor available on the road. The material need not be heated and can be used just as it is received without any modification.

Block Filler

An improved pitch block filler has been developed for use in brick and stone block pavements. The improved pitch does not flow readily in hot weather and still is not excessively brittle in cold weather. Surplus material can be easily removed from the surface of the block.

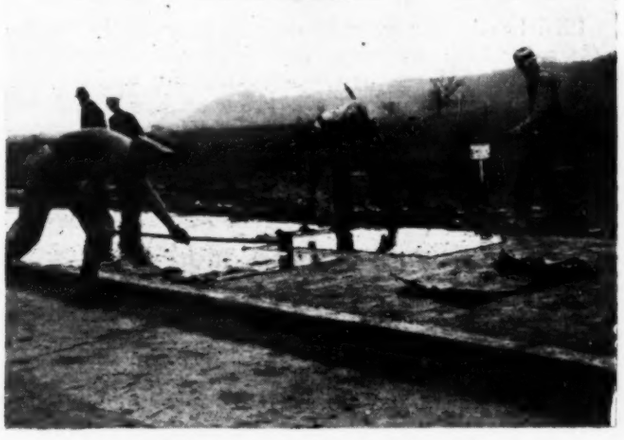
The improved pitch filler retains the adhesiveness and water-proofing qualities of the old pitch with the additional advantages given.

A technical specification for the improved pitch block filler is as follows:

The filler shall be a coal tar pitch conforming to the following requirements:

Softening Point, Ring and Ball, degrees C.	60. to 75.
Penetration, 0°C., 200 grams. 60 seconds	Not less than 12
Penetration, 25°C., 100 grams. 5 seconds	35 to 65
Penetration, 46.1°C., 50 grams. 5 seconds	Not more than 200
Insoluble in Carbon Disulphide, per cent	Not less than 20
Specific Gravity 25°C/25°C	Not less than 1.18

Tar-Treated Gravel in Minnesota



Removing Excess Coal Tar Pitch Filler

Base Stabilization

The stabilization of natural soils for bases by the use of tar is still in the experimental stage. Tars have been successfully used for many years for the stabilization of sand and gravel. In general, however, these materials did not contain more than about fifteen per cent of clay or other very fine matter.

Field experiments have been under way during 1936 using tar as a stabilizing agent on straight clay as well as various mixtures of clay and aggregate.

Mixing Tar-Stabilized Base

Various gardes of tar have been used in this stabilization work. In the light of present knowledge the less viscous tars seem to have the advantage of easier mixing with the soil and yet give satisfactory results in stabilization.

Various methods of application have been tried. In some experiments the tar has been distributed in layers and then mixed with the soil, while in others the tar has been distributed beneath the surface by means of a suboiler and allowed to be distributed by capillary action without mixing. Mixing in a pug mill or similar plant has also been tried. Experimental sections of both wet and dry mixing have been installed. In all of the experiments various percentages of tar have been used to determine the proper amount for the best results.

With the data which will be available, it should be possible soon to specify the proper procedure, grade of tar, and amount of tar necessary for the base stabilization of various natural soils.

Conclusion

1936 has been a year of definite progress in the use of tar for highway purposes. Grades of material and the selection of the best grades for the various road types are being standardized. New materials and new uses are being rapidly developed and introduced.

▼

$200,000,000 of Federal-Aid Highway Funds Apportioned

The secretary of Agriculture on Dec. 29 apportioned to the various states $125,000,000 of regular Federal aid for improvement of the Federal-aid highway system, $25,000,000 for improvement of secondary or farm-to-market roads, and $50,000,000 for elimination of hazards at grade crossings. The new apportionments are for the fiscal year beginning July 1, 1937.

All of these funds will be expended in accordance with the general plan used in previous Federal-aid highway work. Projects for improvement will be selected by State Highway Departments, which will also prepare plans, let contracts and supervise construction, all subject to Federal approval.

The states are required to match the funds for improvement of the Federal-aid system and for secondary roads. It is not required that the grade crossing funds be matched. Funds for use on the Federal-aid system are now available for improving extensions of the system through cities.

Improvement of secondary roads and elimination of grade crossings with Federal funds were first initiated as an emergency measure to relieve unemployment. The new apportionments of funds for these purposes are the first to be made as a part of the regular Federal program. Regulations under which the two new funds will be administered are now being prepared.

The amounts apportioned are shown in the accompanying table:

APPORTIONMENT OF HIGHWAY FUNDS FOR THE FISCAL YEAR 1938

State	Regular Federal Aid	Secondary or Feeder Roads	Grade Crossings	Total
Alabama	$ 2,664,693	$ 532,939	$ 1,015,170	$ 4,212.802
Arizona	1,829,952	365,990	314,594	2,510,536
Arkansas	2,187,752	437,550	893,403	3,518,705
California	4,858,220	971,644	1,874,656	7,704,520
Colorado	2,336,054	467,211	657,357	3,460,622
Connecticut	805,426	161,085	426,784	1,393,295
Delaware	625,000	125,000	250,000	1,000,000
Florida	1,704,765	340,953	712,816	2,758,534
Georgia	3,233,279	646,656	1,223,099	5,103,034
Idaho	1,570,687	314,137	418,115	2,302,939
Illinois	5,238,798	1,047,760	2,644,980	8,931,538
Indiana	3,149,011	629,802	1,308,113	5,086,926
Iowa	3,291,322	658,264	1,410,787	5,360,373
Kansas	3,374,126	674,825	1,307,669	5,356,620
Kentucky	2,349,316	469,863	919,174	3,738,353
Louisiana	1,829,490	365,898	799,226	2,994,614
Maine	1,122,670	224,534	352,468	1,699,672
Maryland	1,043,938	208,787	519,993	1,772,718
Massachusetts	1,769,936	353,987	1,047,500	3,171,423
Michigan	3,893,528	778,706	1,664,807	6,337,041
Minnesota	3,495,178	699,036	1,342,809	5,537,023
Mississippi	2,247,708	449,542	806,707	3,503,957
Missouri	3,877,890	775,578	1,528,920	6,182,388
Montana	2,621,728	524,346	671,204	3,817,278
Nebraska	2,641,423	528,285	892,976	4,062,684
Nevada	1,632,385	326,477	250,000	2,208,862
New Hampshire	625,000	125,000	250,000	1,000,000
New Jersey	1,701,826	340,365	997,689	3,039,880
New Mexico	2,040,685	408,137	432,291	2,881,113
New York	6,258,857	1,251,771	3,424,399	10,935,027
North Carolina	2,998,371	599,674	1,244,662	4,842,707
North Dakota	1,996,414	399,283	803,068	3,198,765
Ohio	4,640,344	928,069	2,141,704	7,710,117
Oklahoma	2,995,620	599,124	1,156,175	4,750,919
Oregon	2,092,368	418,474	588,377	3,099,219
Pennsylvania	5,434,356	1,086,871	2,905,671	9,426,898
Rhode Island	625,000	125,000	250,000	1,000,000
South Carolina	1,722,188	344,438	752,928	2,819,554
South Dakota	2,084,100	416,820	694,096	3,195,016
Tennessee	2,681,110	536,222	958,753	4,176,085
Texas	7,957,610	1,591,522	2,724,825	12,273,957
Utah	1,447,780	289,556	322,885	2,060,221
Vermont	625,000	125,000	250,000	1,000,000
Virginia	2,328,369	465,674	941,656	3,735,699
Washington	2,002,877	400,575	767,991	3,171,443
West Virginia	1,390,447	278,089	671,712	2,340,248
Wisconsin	3,107,053	621,411	1,252,871	4,981,335
Wyoming	1,600,350	320,070	344,961	2,265,381
Dist. of Colum.	.....	.....	250,000	250,000
Hawaii	625,000	125,000	250,000	1,000,000
Puerto Rico	625,000	125,000	369,959	1,119,959
Total	$125,000,000	$25,000,000	$50,000,000	$200,000,000

STATE HIGHWAY CONSTRUCTION

Reports from Highway Officials Showing Mileage Completed and Expenditures in 1936 and Probable Mileage and Expenditures in 1937

NEW ENGLAND DIVISION

Maine

The following tabulations show the approximate mileage of construction for 1936 and proposed for 1937 on the state highway system and on secondary road:

APPROXIMATE MILEAGES—STATE HIGHWAY SYSTEM

Completed in 1936
- 42 miles gravel
- 13 miles bituminous macadam
- 14 miles bitiuminous concrete
- 0.5 mile concrete

Started in 1936—carried over to 1937
- 17 miles gravel
- 2 miles bituminous macadam
- 2.7 miles bituminous concrete
- 1.7 miles concrete

Proposed—1937
- 22 miles gravel
- 9 miles bituminous macadam
- 6 miles bituminous concrete

APPROXIMATE MILEAGES—SECONDARY ROADS

Completed in 1936	Gravel	Bit. Macadam
State Aid	175 miles	2 miles
Third Class	90 miles	.....
Special Resolve	15 miles	.....
Federal Funds	33 miles	.....
Total	313 miles	2 miles
Started in 1936—carried over to 1937		
State Aid and Third Class	18 miles	.....
Federal Funds	2 miles	.....
Total	20 miles	.....
Proposed 1937 work		
State Aid	170 miles	2 miles
Third Class	90 miles	.....
Special Resolve	15 miles	.....
Federal Funds	25 miles	.....
Total	300 miles	2 miles

L. D. Barrows, Augusta, Me., is Chief Engineer State Highway Commission.

New Hampshire

A total of 105 miles of state highway was completed in 1936 involving an expenditure of $1,566,000. About $565,000 was spent for bridges. It is not possible to estimate this year's program at this time.

F. E. Everett, Concord, N. H., is State Highway Commissioner.

Vermont

The following shows the work completed in 1936, the uncompleted work carried over into 1937, and the work so far definitely programmed for 1937:

Construction Completed in 1936	Miles
Concrete	5.2
Macadam	29.7
Bituminous Treated Gravel	69.6
Grading	5.4
Gravel Surface	5.4
Construction Carried Over into 1937	
Concrete	6.0
Macadam	5.4
Bituminous Treated Gravel	10.0
Grading	5.4
Gravel	1.0
Construction Definitely Programmed for 1937	
Bituminous Treated Gravel	1.8
Grading	13.1

The total expenditures and probable amount available for new construction in 1937 are not available at this time, being dependent upon the legislative appropriations.

Hubert E. Sargent, Montpelier, Vt., State Highway Commissioner.

Rhode Island

During the past year a total of 28.15 miles of road construction was completed by the State Division of Roads and Bridges. This consisted of 16.92 miles of new construction, comprising:

0.61 miles of bituminous macadam
1.48 miles of bituminous surface on concrete base
14.83 miles surface-treated and mixed-in-place types of gravel

The reconstruction (11.33 miles) covered:

0.17 miles of bituminous macadam
7.59 miles reinforced cement concrete
3.57 miles bituminous surface on concrete base

Projects which will be carried through the winter for completion next spring and early summer involves:

5.55 miles of bituminous macadam
4.00 miles of reinforced cement concrete
1.30 miles bituminous surface on concrete base

It is not possible at this time to state what the expenditures for the coming year will amount to or what type of construction program will be undertaken. This is dependent largely on appropriations to be made by the state legislature during its January, 1937, session.

N. C. Thierfelder, Providence, R. I., is Acting Chief, Division of Roads and Bridges.

Connecticut

During the fiscal year, June 30, 1935 to June 30, 1936, work on trunk line and state aid highways costing $8,827,000 was completed under the direction of the State Highway Department. Work on town aid highways costing $414,000 also was completed during the above period. The following table gives some details of the work:

	Trunk Line & State Aid Miles	Town Aid Miles
Graded	8.53	....
Gravel	1.73	....
Loose gravel	....	31.16
Rolled gravel	....	16.33
Loose gravel oiled	....	3.47
Rolled gravel oiled	....	16.49
Waterbound Macadam	73.93	2.24
Bituminous Macadam	81.31	....
Bituminous concrete	11.27	....
Reinforced concrete	4.83	....
Total	181.60	69.69

The costs include all construction except overhead. It is not practical to obtain the average cost per mile due to the various widths, land costs, etc. involved.

During the present fiscal year the department is doing a considerable amount of grading work on the Merritt Parkway, none of which will be paid for until 1937. In addition it is carrying over into 1937 considerable heavy bridge construction, notably the Middletown-Portland Bridge and approaches, which will cost approximately $3,500,000. John A. MacDonald, Hartford, Conn., is State Highway Commissioner.

MIDDLE ATLANTIC DIVISION

New York

New York State Division of Highway awarded contracts during 1936 for 303 miles of highway, the funds obligated amounting to $40,283,000. It is impossible at this time to give outline of 1937 construction program.

Arthur W. Brandt, Albany, N. Y., is State Commissioner of Highways.

New Jersey

A total of 56 miles of state highway was completed in 1936 at an expenditure of approximately $9,580,000. Probable mileage for this year is 61 calling for an approximate expenditure of $12,834,000.

Frank Bedwell, Trenton, N. J., is State Highway Engineer.

Pennsylvania

Total highway expenditures for fiscal year July 1, 1936, to July 1, 1937, are estimated at $80,000,000. This figure includes federal and state funds for roads, bridges, grade crossing elimination, salaries, etc. Number of miles of completed new construction of all types for calendar year 1936 is 300. Total miles under contract is 453. This does not include township, county and borough roads construction and maintenance which State Highway Department oversees. Millions were expended this year for flood damage to roads and bridges. Pennsylvania is making drive to bridge gaps in its highway system with modern bridges, 59 of most dangerous grade crossings and overhead and underpasses being eliminated under present federal program. Pennsylvania has been allotted $9,000,000 federal aid for fiscal year starting July 1, 1937; this includes roads, bridges and grade crossing elimination.

H. H. Temple, Harrisburg, Pa., is Chief Engineer State Highway Department.

EAST NORTH CENTRAL DIVISION

Illinois

During 1936 Illinois completed 251 miles of high type pavement, 142 miles of bituminous surfacing, 600 miles of gravel or crushed stone surfacing, 565.84 miles of grading, 224 bridges and 47 railroad grade separations. This includes work performed by the counties and municipalities under state jurisdiction, as well as that done directly by the state. The state has installed automatic flashing light protection at 265 railroad grade crossings and special reflectorized warning signs at 420 others.

The program for 1937 is still somewhat tentative, but it is estimated that it will include about 250 miles of high type pavement, 25 miles of bituminous surfacing, 345 miles of gravel or crushed stone surfacing, 295 miles of grading, 100 bridges and 48 railroad grade separations. The total construction expenditure will be approximately $35,000,000. This includes work already under contract and carried over from 1936, valued at about $16,000,000. It is also based upon the assumption that the next Congress will actually make the Federal aid appropriations authorized by the last Hayden-Cartwright Act, under which the state would receive allotments amounting to about $8,500,000. This 1937 estimate includes only work to be done directly by the state. Estimates on county and municipal construction are not available at this time.

Ernest Lieberman, Springfield, Ill., is Chief Highway Engineer.

Federal Highway Funds Appropriated, Allocated and Authorized as of Sept. 30, 1936

Compiled by U. S. Bureau of Public Roads

Acts	Funds			Classification of Highways						
	Regular	Emergency	Total	Federal Aid and Misc.	Forests	Public Lands	Parks and Parkways	Indian Reservation	Public Works Projects	Total
National Industrial Recovery Act, approved June 16, 1933										
Sections 202 and 203	$	$ 8,331,000	$ 8,331,000	$ 8,331,000	$	$	$	$	1/ $	$ 8,331,000
Work-relief (1934)		77,690,850	77,690,850						1/ 77,690,850	77,690,850
Dockets (1934)		400,000,000	400,000,000	400,000,000						400,000,000
Section 204 (1934)		58,900,000	58,900,000		24,700,000	5,000,000	25,200,000	4,000,000		58,900,000
Section 205 (1934)		544,921,850	544,921,850	408,331,000	24,700,000	5,000,000	25,200,000	4,000,000	77,690,850	544,921,850
Total										
Hayden-Cartwright Act, approved June 18,1934										
Section 1 (1935)		200,000,000	200,000,000	200,000,000						200,000,000
Section 5 (1935) Restoration of roads and bridges		10,000,000	10,000,000	10,000,000						10,000,000
Section 4 (1936 & 1937)	250,000,000		250,000,000	250,000,000						250,000,000
Section 5 (1936 & 1937)	20,000,000		20,000,000		20,000,000					20,000,000
Section 6 (1936 & 1937)	5,000,000		5,000,000			5,000,000				5,000,000
Section 7 (1936 & 1937)	15,000,000		15,000,000				15,000,000			15,000,000
Section 8 (1936 & 1937)	8,000,000		8,000,000					8,000,000		8,000,000
Total	298,000,000	210,000,000	508,000,000	460,000,000	20,000,000	5,000,000	15,000,000	8,000,000		508,000,000
Emergency Appropriation Act 1935, approved June 19, 1934										
Roads within Grounds at Monticello,Va. (1935)	30,000		30,000	30,000						30,000
Inter-American Highway	1,000,000		1,000,000	1,000,000						1,000,000
Title II		21,500,000	21,500,000		10,000,000	2,500,000	7,000,000	2,000,000		21,500,000
Total	1,030,000	21,500,000	22,530,000	1,030,000	10,000,000	2,500,000	7,000,000	2,000,000		22,530,000
Emergency Relief Appropriation Act of 1935, approved April 8, 1935 (1936)		487,053,706	487,053,706	399,621,865			2/ 1,261,685		3/ 86,170,156	487,053,706
Emergency Relief Appropriation Act of 1936, approved June 22, 1936 (Restoration of roads and bridges due to flood damage)		4,416,204	4,416,204	3/ 4,416,204						4,416,204
Hayden-Cartwright Act, approved June 16,1936										
Section 1 (1938 & 1939) Federal Aid	250,000,000		250,000,000	250,000,000						250,000,000
Section 2 (1938 & 1939)	28,000,000		28,000,000		28,000,000					28,000,000
Section 3 (1938 & 1939)	5,000,000		5,000,000			5,000,000				5,000,000
Section 4 (1938 & 1939) (Parks)	15,000,000		15,000,000				15,000,000			15,000,000
Section 5 (1938 & 1939) (Parkways)	20,000,000		20,000,000				20,000,000			20,000,000
Section 6 (1938 & 1939)	8,000,000		8,000,000					8,000,000		8,000,000
Section 7 (1938 & 1939) (Secondary)	50,000,000		50,000,000	50,000,000						50,000,000
Section 8 (1938 & 1939) (Grade Crossings)	100,000,000		100,000,000	100,000,000						100,000,000
Total	476,000,000		476,000,000	400,000,000	28,000,000	5,000,000	35,000,000	8,000,000		476,000,000
Grand total	775,030,000	1,267,891,760	2,042,921,760	1,673,399,069	82,700,000	17,500,000	83,461,685	22,000,000	163,861,006	2,042,921,760

1/ Under supervision of Bureau of Public Roads $31,400,000; Public Works Administration $46,290,850
2/ Allocated for Natchez Trace Project
3/ Under supervision of Bureau of Public Roads $36,000,000; Public Works Administration $50,170,156
4/ Allocations to September 30, 1936

Michigan

The state highway department closed the largest construction program in its history, with expenditures reaching $29,000,000. To this amount might be added the sum of $3,000,000 which is the approximate amount the WPA has contributed to state trunk line projects during the year.

The present known sources of construction funds for 1937 are as follows:

1st. Unexpended funds or work carried over from 1937 Federal Aid, WP Highway and WP Grade Crossing programs totaling $4,802,000.

2nd. 1938 regular Federal Aid amounting to $7,605,000.

3rd. 1938 Grade crossing program amounting to $1,580,000.

This gives the department a total definite program of $13,987,000 for the year. In addition to its so-called regular construction work, as above indicated, the department is anticipating the supervision of the expenditure of $10,000,000 of combined state and WPA funds on grading projects during the coming season.

The mileages of the various types of roads completed this year are as follows:

	Miles
Concrete pavement	270
Concrete pavement widening	10
Sheet asphalt	6
Bituminous concrete	66
Oil-aggregate	232
Non-skid surface treatment	41
Gravel	47
Total	672

H. C. Coons, Lansing, Mich., is Deputy Highway Commissioner and Chief Engineer.

WEST NORTH CENTRAL DIVISION

Iowa

Approximately $14,000,000 was expended in 1936 under the direction of State Highway Commission for construction purposes. The following tables show the work accomplished:

Primary Road Construction Work Complete in 1936

Paving	206.2	miles
Bituminous Surfacing	143.9	miles
Gravel Surfacing	157.8	miles
Grading	169.1	miles
Bridges and Culverts	1,076	structures

Secondary Road Construction Work Completed in 1936

Paving	5.75	miles
Gravel Surfacing	265.1	miles
Grading	200.1	miles
Bridges and Culverts	1,036	structures

The work under construction carried over into 1937 includes the following:

Paving	140.5	miles
Gravel Surfacing	60.0	miles
Grading	157.9	miles
Bridges and Culverts	384	structures

Status of U. S. Public Works Road Construction as Provided by Section 204 of the National Industrial Recovery Act (1934 Funds) and by the Act of June 18, 1934 (1935) Funds), as of Nov. 30, 1936. Classes 1, 2 and 3

Compiled by U. S. Bureau of Public Roads

STATE	APPORTIONMENTS		COMPLETED				UNDER CONSTRUCTION				APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS	
	Sec. 204 of the Act of June 16, 1933 (1934 Fund)	Act of June 18, 1934 (1935 Fund)	Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	Estimated Total Cost	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds	Mileage	1934 Public Works Funds	1935 Public Works Funds
Alabama	$ 8,370,133	$ 9,259,682	$15,385,528	$ 8,309,382	$ 3,568,390	760.1	$ 339,771	$ 52,665	$ 339,310	15.8		$ 309,852	8.9	$ 113,085	$ 86,890
Arizona	5,811,960	8,041,935	8,981,796	5,809,512	2,605,076	582.9	12,500		12,500					7,348	29,399
Arkansas	6,748,335	3,428,069	10,502,752	6,633,093	3,320,347	615.3	183,831	70,019	78,991	4.0	$ 31,309	7,000	10.9	13,839	87,511
California	15,607,358	7,932,206	30,579,898	15,582,063	7,769,804	758.7	115,086		115,086			820		85,891	46,567
Colorado	6,879,530	3,466,006	11,257,808	6,870,681	3,841,857	633.0	6,619		6,619					3,849	37,520
Connecticut	2,865,760	1,459,868	4,519,547	2,758,269	1,312,944	76.0	59,618	59,618		.1				47,894	141,584
Delaware	1,819,088	983,335	2,680,734	1,818,804	815,188	128.3	109,467		109,506	1.6				256	2,668
Florida	5,831,834	2,661,343	8,937,748	5,175,534	2,344,569	305.6	858,979		230,665	4.0	56,300	67,339	.2		18,775
Georgia	10,091,185	5,113,491	13,210,656	9,317,893	3,168,476	743.7	1,076,581	408,689	667,832	81.9	84,072	165,358	3.6	880,531	1,111,885
Idaho	4,486,869	2,277,465	7,084,461	4,416,568	2,105,517	500.5	59,198		58,038	.1	60,771	1,686	.2	8,310	38,069
Illinois	17,570,770	8,921,901	25,748,361	16,893,752	7,817,218	708.6	1,789,642	598,899	1,068,172	15.8	37,500	7,100	12.8	96,509	88,311
Indiana	10,037,893	5,088,963	15,360,433	9,896,395	4,733,207	479.1	373,636	189,083	204,553	11.0		56,788		18,405	58,475
Iowa	10,055,660	5,118,361	15,359,593	10,059,900	4,797,361	1,888.8	390,073		381,000	5.1	499			251	
Kansas	10,089,606	5,117,675	15,427,520	10,089,600	4,996,220	1,138.3	188,993		67,827	13.1				6	59,180
Kentucky	7,517,359	3,818,311	11,961,870	7,940,139	3,571,867	807.7	875,174	59,003	814,500	8.0	8,569	83,850		1,049	8,698
Louisiana	5,828,531	8,963,932	8,582,708	5,731,008	2,928,730	258.5	318,465		198,436	13.9		128,378	5.2	41,096	48,367
Maine	3,369,917	1,711,585	5,284,109	3,346,879	1,660,075	153.5	22,624		7,624	1.4		25,540	1.4	8,028	6,777
Maryland	3,569,587	1,810,098	5,536,045	3,477,038	1,810,498	144.5	168,167		161,778	5.3		885,493	7.3	87,709	358,376
Massachusetts	6,597,100	3,350,478	9,869,513	6,952,734	2,693,290	115.8	320,416		320,416	.3		91,594	.1	44,367	178,886
Michigan	18,736,827	6,952,568	30,628,589	18,696,114	6,268,495	766.9	168,750	40,113	67,600	1.2		136,788	.6		3,649
Minnesota	10,656,569	5,405,551	16,081,251	10,584,822	4,745,392	1,652.0	479,905	58,110	376,135	17.8		36,800	.6	69,036	869,884
Mississippi	6,978,675	3,540,827	12,693,004	6,735,812	2,992,048	721.4	653,785	188,861	464,865	22.7	3,960	41,503	1.9	50,365	41,211
Missouri	12,180,308	6,173,780	17,811,196	11,637,186	5,780,320	1,436.7	2,778,630	471,210	1,339,860	15.1		62,100		71,999	57,061
Montana	7,439,748	3,769,739	11,799,599	7,405,876	3,701,189	1,058.6	56,596		56,596					14,272	11,999
Nebraska	7,888,961	3,969,359	12,888,947	7,813,593	3,608,469	1,018.3	882,087		878,608	27.8		63,337	5.9	15,368	81,796
Nevada	4,545,917	2,302,356	7,060,951	4,545,917	2,268,591	758.8	85,004		85,004			1,660			7,111
New Hampshire	1,909,439	969,962	3,003,046	1,908,951	950,695	78.3	6,176		6,176					4,888	19,793
New Jersey	6,346,033	3,220,879	8,855,887	6,046,046	1,607,061	82.0	1,369,004	180,518	1,009,396	18.1	82,195	99,875	.6	97,330	105,197
New Mexico	5,752,935	2,921,700	8,788,982	5,734,176	2,827,536	783.9	107,130		107,130	5.9		8,695		58,739	6,338
New York	22,330,101	11,327,521	38,763,582	21,778,931	10,099,363	815.4	1,751,430	399,810	982,899	8.3	133,967	162,875	1.3	17,513	87,769
North Carolina	9,522,293	4,860,981	14,891,750	9,159,957	4,505,525	1,382.1	365,770	291,910	73,860	15.3	51,017	800,873	8.1	19,908	60,683
North Dakota	5,808,448	2,938,967	8,367,434	5,609,002	2,025,164	2,098.0	646,658	114,385	350,879	98.2	19,703	101,160	17.0	65,818	461,799
Ohio	15,469,592	7,865,012	24,406,155	15,358,665	7,218,853	784.7	620,858	73,790	517,531	11.4	38,603	87,639	4.3	84,114	87,549
Oklahoma	9,216,798	4,685,180	14,535,440	9,146,565	4,303,865	824.9	182,756	67,007	115,749	1.6		174,301	.8	3,886	91,865
Oregon	6,106,896	3,097,816	9,882,293	6,033,064	2,923,050	467.6	99,469	11,308	88,161	1.2		87,861		26,595	53,332
Pennsylvania	18,891,009	9,590,788	28,719,052	18,998,822	8,748,721	1,050.6	518,605	96,463	377,896	6.0	153,388	158,883	4.3	166,331	307,944
Rhode Island	1,998,708	1,016,572	3,144,150	1,998,708	1,012,096	89.1									2,878
South Carolina	5,869,169	8,770,956	7,914,946	5,839,171	2,379,367	614.7	336,987	158,996	166,996	12.3	46,380	119,758	8.1	14,788	108,823
South Dakota	6,011,479	3,047,643	9,822,498	5,816,751	2,825,595	1,942.7	881,833	101,580	139,753	36.7		37,133	83.8	93,894	61,181
Tennessee	8,492,619	4,308,991	13,831,533	8,498,593	3,901,956	691.0	307,098		307,098	5.3		46,727	5.9	76	57,816
Texas	26,263,086	12,891,253	37,588,691	23,907,969	11,760,024	2,779.8	878,512	288,348	183,347	.9	18,000	89,593	2.0	39,506	382,918
Utah	4,190,708	2,132,691	7,337,875	4,160,916	2,098,401	580.9	70,718	32,690	38,290					1,500	
Vermont	1,867,573	948,007	3,186,369	1,867,452	982,672	181.0	867,068	37,959	811,461	30.1	50,946	58,917	7.4	181	5,335
Virginia	7,416,757	3,765,387	11,651,983	7,893,588	3,610,817	607.9			46,596			24,883	.3	34,883	83,813
Washington	6,115,867	3,108,812	9,900,513	6,118,040	3,085,446	398.7	46,596							3,895	13,961
West Virginia	4,476,236	2,280,335	6,851,903	4,315,121	1,636,782	211.1	591,685	83,539	460,088	11.4		66,405	.7	75,579	117,160
Wisconsin	9,784,881	4,971,857	15,821,108	9,715,778	4,879,614	619.7	80,256		80,256			2,720		9,110	37,827
Wyoming	4,501,387	2,287,712	6,879,280	4,451,588	2,218,377	1,037.7	5,781	5,780		.3		33,085		43,685	36,950
District of Columbia	1,918,469	973,842	2,897,586	1,918,469	958,973	88.3									6,863
Hawaii	1,871,062	949,778	2,833,451	1,870,383	850,955	51.1	650,838		646,859	4.8		14,000		679	83,566
TOTALS	396,000,000	200,000,000	622,136,677	387,368,704	179,813,682	36,850.2	19,011,809	4,082,795	13,183,351	479.6	862,398	2,946,839	138.0	1,686,962	6,716,162

The approximate construction expenditures for 1937 are $12,000,000. The probable construction program is as follows:

Primary Road System	
Pavement	230 miles
Grading, Bridges and Culverts	30 miles
Bituminous Surfacing	120 miles
Secondary Road System	
Grading, Bridges and Culverts	200 miles

F. R. White, Ames, Ia., is Chief Engineer State Highway Commission.

Missouri

During the first 10 months of 1936 the State Highway Department spent $9,500,000 on construction. Probably $1,000,000 additional was spent during the succeeding two months.

It is expected to have close to $10,000,000 for new work in 1937. The following table is an estimate of the work done during 1936 and the new work for 1937:

	Miles
Construction Work Completed During 1936	
Earth Grading	945
Gravel Surfacing	930
Bituminous Types	414
Portland C. Concrete	152
Carry Over to 1937	
Earth Grading	147
Gravel Surfacing	101
Bituminous Types	103
Portland C. Concrete	95
New Work for 1937	
Earth Grading	513
Gravel Surfacing	341
Bituminous Types	246
Portland C. Concrete	106

C. W. Brown, Jefferson City, Mo., is Chief Engineer, State Highway Department.

North Dakota

The cost of work completed under the direction of the State Highway Department from Dec. 1, 1935 to Dec. 1, 1936 was $3,188,000. The amount available for new construction in 1937 is approximately $5,500,000.

The mileage completed, uncompleted and proposed is as follows:

	Miles Completed 12-1-35 to 12-1-36	Miles Not Completed 12-1-36	Proposed for 1937
Grading	179.9	30.2	105
Re-grading	103.8	21.2	300
Gravel	227.3	81.2	300
Re-gravel	65.5	63.1	100
Oil Mix	74.9	39.6	85
Paving	3.4	1.6	0
Total	654.8	236.9	890

The work proposed for 1937 is only an estimate as any of the various types may be increased or decreased. H. C. Frahm, Bismarck, N. Dak., is Chief Engineer State Highway Department.

South Dakota

Expenditures in 1936 were $7,200,000. The work completed included: 290 miles grading, 360 miles gravel surfacing, bituminous 260 miles, and concrete 25 miles.

The probable expenditures for 1937 total $5,600,000. The proposed work includes: 150 miles grading, 250 miles gravel surfacing, 250 miles bituminous and 40 miles concrete.

Fred Schrader, Pierre, S. Dak., is State Highway Engineer.

Nebraska

Total expenditures for 1936 were as follows: Federal aid, $7,874,173; state, $2,780,514; other funds, $244,792. The following work was completed: Grading, 534 miles; pavement, 302; gravel, 607 miles; bridges, 92; viaducts, 14; subways, 2.

A. T. Lobdell, Lincoln, Neb., is Chief Bureau of Roads.

Status of Federal Aid Highway Projects, 1936-1937, as of Nov. 30, 1936

Compiled by U. S. Bureau of Public Roads

STATE	APPORTIONMENT	COMPLETED			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE AFTER DEDUCTING AMOUNTS PREVIOUSLY PROGRAMED
		Federal Final Cost	Federal Aid	Miles	Federal Final Cost	Federal Aid	Miles	Federal Final Cost	Federal Aid	Miles	
Alabama	$ 5,208,287	$ 51,600	$ 25,800	9.0	$ 710,181	$ 355,090	20.1	$ 730,700	$ 365,350	35.3	$ 4,462,047
Arizona	3,564,709	1,777,592	1,378,202	98.3	1,019,637	807,343	41.2	594,800	179,220	7.3	1,199,944
Arkansas	4,275,989							1,765,401	1,764,739	60.0	2,511,190
California	9,508,671	3,259,773	1,884,211	88.9	9,341,966	5,348,228	266.7	2,778,299	1,599,478	60.3	676,354
Colorado	4,575,144	2,914,634	1,543,884	109.8	3,277,034	1,804,071	118.7	1,280,437	715,991	50.7	511,198
Connecticut	1,582,913	491,873	245,937	3.5	781,053	361,384	6.9	120,800	60,850	3.8	915,331
Delaware	1,218,750	305,980	152,960	30.3	339,069	184,048	9.9	436,408	204,962	14.8	696,780
Florida	3,315,558	831,120	415,560	87.5	598,555	299,273	19.3	542,200	271,100	20.9	2,329,685
Georgia	6,336,843	936,238	416,776	72.1	2,435,848	1,217,924	188.7	921,133	450,951	39.0	4,230,811
Idaho	3,065,306	1,527,993	1,145,730	235.2	1,450,283	867,845	73.8	406,340	243,151	22.6	808,578
Illinois	10,325,922	5,190,075	2,589,328	90.2	6,858,776	3,394,913	135.9	4,018,070	1,985,610	98.8	2,358,078
Indiana	6,189,258	5,258,269	2,183,161	133.3	2,769,971	1,584,046	88.5	3,057,650	1,823,258	88.2	828,798
Iowa	6,466,628	6,757,971	3,196,508	485.5	3,342,843	1,621,270	134.7	2,090,518	1,010,224	64.0	638,626
Kansas	6,631,085	2,903,124	1,500,886	599.0	4,629,975	2,288,486	357.5	2,212,052	1,106,010	114.7	1,735,703
Kentucky	4,611,955	2,185,837	1,071,030	192.0	976,931	487,466	83.8	872,456	431,784	41.2	2,681,676
Louisiana	3,557,930	1,463,014	789,308	52.9	1,804,776	602,374	41.3	593,690	296,845	13.1	1,989,403
Maine	2,177,197	1,904,831	951,618	58.7	799,888	399,944	18.5	299,120	147,560	8.6	678,075
Maryland	2,050,870				926,493	462,812	12.9	809,838	361,836	10.9	1,226,761
Massachusetts	3,485,364	333,935	166,968	3.1	4,490,403	2,195,201	17.5	14,206	7,102		1,116,093
Michigan	7,668,768	5,517,385	2,754,470	224.5	5,371,468	4,185,734	225.2	1,204,594	611,297	25.5	117,867
Minnesota	6,849,307	7,479,557	3,702,191	582.3	2,331,861	1,162,143	118.2	1,561,568	780,582	58.6	1,203,931
Mississippi	4,387,636				894,105	187,052	16.3	1,133,470	567,035	70.9	3,673,549
Missouri	7,601,200	3,456,539	1,728,004	488.8	6,537,180	3,267,488	241.3	2,529,454	1,390,349	119.2	1,819,426
Montana	5,182,333	3,150,971	2,105,635	384.1	2,687,817	1,610,508	172.1	630,217	325,116	23.2	1,180,875
Nebraska	5,167,930	2,593,741	1,298,944	164.9	2,801,982	1,406,543	288.0	61,709	30,855	4.8	2,435,588
Nevada	3,189,479	1,468,617	1,269,957	269.5	691,480	596,643	14.3	9,600	9,300	.5	1,337,039
New Hampshire	1,218,750	758,362	378,685	82.5	286,188	142,523	4.6	10,550	5,875		686,867
New Jersey	3,352,469	1,833,713	916,837	88.1	2,680,869	1,282,830	85.1	384,309	162,195	5.4	1,010,648
New Mexico	3,990,023	2,671,651	1,623,798	208.7	1,935,276	1,196,066	171.2	908,535	552,567	33.1	617,593
New York	12,306,710	5,511,336	2,754,167	116.2	15,312,576	7,565,887	260.2	2,110,688	1,146,199	88.6	880,957
North Carolina	5,879,466	1,989,822	994,050	254.2	2,705,079	1,325,591	247.6	1,905,773	883,086	76.1	2,676,758
North Dakota	3,918,269				400,450	212,950	.4				3,705,319
Ohio	9,131,896	1,474,536	737,268	26.9	6,737,210	3,183,286	71.2	587,960	258,480	5.8	4,918,170
Oklahoma	5,884,927	2,153,021	1,122,895	76.9	1,714,378	858,050	60.3	1,113,320	529,529	43.1	3,333,853
Oregon	4,089,711	2,348,344	1,416,769	92.9	2,983,384	1,777,026	108.1	577,184	328,210	24.1	571,706
Pennsylvania	10,695,448	5,289,095	2,644,102	85.8	7,768,600	3,873,366	105.8	2,735,688	1,355,893	17.8	2,822,131
Rhode Island	1,218,750	83,810	11,905	.3	593,768	296,884	6.6	488,757	243,379	4.2	666,982
South Carolina	3,381,337	32,682	15,000	6.7	3,235,070	1,309,680	239.1	1,818,052	718,750	124.8	1,337,967
South Dakota	4,078,647	1,396,853	784,004	188.6	73,731	51,839	16.4	373,840	207,680	46.9	3,035,583
Tennessee	5,256,270	1,915,051	995,398	80.3	897,474	488,738	33.0	308,678	151,439	10.0	3,732,701
Texas	15,548,821	9,281,213	4,629,891	526.8	5,658,953	2,825,005	244.3	2,668,582	1,330,044	167.0	6,765,081
Utah	2,826,960	1,995,580	1,488,573	137.9	537,531	386,605	36.2	586,838	336,547	38.6	617,829
Vermont	1,218,750	1,323,336	659,042	62.9	765,404	358,753	80.2	189,680	84,750	4.3	140,805
Virginia	4,559,200	2,157,804	1,076,576	85.8	2,146,464	1,072,889	97.9	1,954,788	977,360	55.8	1,433,036
Washington	3,909,738	2,905,718	1,540,303	100.9	2,634,116	1,383,771	121.4	591,112	295,100	6.6	776,964
West Virginia	2,716,754	398,060	199,030	22.5	1,134,980	567,473	36.1	779,046	389,523	17.3	1,560,728
Wisconsin	6,090,504	3,675,354	1,755,618	150.3	4,058,518	1,975,646	139.8	457,915	227,885	18.3	2,131,415
Wyoming	3,121,972	2,780,220	1,696,958	367.3	1,179,893	730,843	165.0	158,790	94,100	30.8	600,571
District of Columbia	1,218,750				467,855	231,167	8.2	69,938	34,758	1.6	952,829
Hawaii											
TOTALS	263,750,000	114,123,180	59,723,537	6,821.9	135,478,030	69,368,085	4,787.2	51,596,184	27,033,806	1,895.5	87,624,572

EAST SOUTH CENTRAL DIVISIONS

Delaware

During 1936 49.5 miles of new highway were completed, 66 miles of widening and 4 miles of sidewalks, at a cost of $1,440,000. The probable program for 1937 calls for 115 miles new highway, 30 miles widening, 5 miles sidewalks. The estimated cost is $2,300,000, of which $820,000 represents work carried over from 1936.

W. W. Mack, Dover, Del., is Chief Engineer State Highway Department.

Maryland

Total expenditures for highway and bridge construction and maintenance for the fiscal year 1936 were $7,040,274 of which $5,153,279 was for construction and the remainder for maintenance.

The mileage completed and under construction was as follows:

Mileage Built, 1936, 77.57:		Mileage Under Construction Dec. 1, 1936, 109.22:	
Grading and Drainage	12.81	Grading and Drainage	29.97
Stabilized Earth	7.14	Stabilized Earth	10.22
Gravel	12.48	Gravel	4.75
Macadam	27.55	Macadam	9.99
Concrete	4.07	Concrete	39.35
Bituminous Surfacing	13.52	Bituminous Surfacing	14.94

The total amount available for the 1937 program including construction and maintenance is $12,955,777.

Nathan L. Smith, Baltimore, Md., is Chief Engineer State Roads Commission.

North Carolina

The following is an outline of the work completed in this state in 1936, the uncompleted work carried over to 1937 and probable program for the coming year:

COMPLETED WORK IN 1936—ROADS

Grading	45 Miles
Topsoil, sand clay, gravel and crushed stone surfacing	43 Miles
Bituminous surface treatment	190 Miles
Sand asphalt surfacing	5 Miles
Concrete pavement	45 Miles
Approximate cost—roads	$2,300,000
Approximate cost—structures (including overhead crossing and underpasses—grade crossing elimination)	$ 765,000

WORK UNDER CONSTRUCTION—ROADS

Grading	95 Miles
Topsoil, sand clay, gravel and crushed stone surfacing	135 Miles
Bituminous surface treatment	145 Miles
Sand asphalt surfacing	38 Miles
Concrete pavement	47 Miles
Approximate cost—roads	$4,200,000
Approximate cost—structures (including overhead crossings and underpasses—grade crossing elimination)	$1,670,000

PROPOSED WORK FOR 1937—ROADS

Grading	200 Miles
Topsoil, sand clay, gravel and crushed stone surfacing	300 Miles
Bituminous surface treatment	350 Miles
Sand asphalt surfacing	30 Miles
Concrete pavement	100 Miles
Approximate cost—roads	$7,800,000
Approximate cost—structures (including overhead crossings and underpasses—grade crossing elimination)	$4,500,000

W. Vance Baise, Raleigh, N. C., is State Highway Engineer.

South Carolina

During the fiscal year ended June 30, 1936, the State Highway Department advanced the state highway system by the completion of approximately 195 miles of

Status of U. S. Works Program Grade Crossing Projects (as Provided by the Emergency Relief Appropriation Act of 1935), as of Nov. 30, 1936

Compiled by U. S. Bureau of Public Roads

STATE	APPORTIONMENT	COMPLETED		NUMBER			UNDER CONSTRUCTION		NUMBER			APPROVED FOR CONSTRUCTION		NUMBER			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	Works Program Funds	Grade Crossings Eliminated by Relocation	Grade Crossings Eliminated by Separation	Grade Crossings Protected by Other Means	Estimated Total Cost	Works Program Funds	Grade Crossings Eliminated by Relocation	Grade Crossings Eliminated by Separation	Grade Crossings Protected by Other Means	Estimated Total Cost	Works Program Funds	Grade Crossings Eliminated by Relocation	Grade Crossings Eliminated by Separation	Grade Crossings Protected by Other Means	
Alabama	$ 4,034,617	$ 606,753	$ 606,753	11		4	$ 2,961,384	$ 2,961,384	36			$ 313,047	$ 313,047	3		8	$ 153,434
Arizona	1,256,099	618,960	614,726	7			566,261	554,816	6								86,557
Arkansas	3,574,060	1,135,951	1,131,634	29	4		1,726,085	1,723,087	22	1		662,597	661,542	8	1	29	57,797
California	7,486,362	2,946,841	2,840,344	19	6		4,467,380	4,329,593	85	2							316,486
Colorado	2,631,567	1,076,063	1,055,063	20			868,611	868,583	7	1							707,921
Connecticut	1,718,686						961,087	891,009	3	1	1	494,014	494,014	1	2		787,661
Delaware	418,239						143,486	120,000	1								298,239
Florida	2,827,883	660,331	658,600	5	4		1,431,369	1,430,789	17	2		456,292	456,292	7			282,208
Georgia	4,895,949	12,090	12,090	1			354,170	354,170	6	2		510,359	510,359	17			4,019,330
Idaho	1,674,479	824,073	821,481	13	1		413,637	413,637	6			64,486	64,486	1		18	374,874
Illinois	10,307,184	2,423,431	2,422,894	31			5,528,177	5,528,177	32	5		2,139,800	2,139,800	11	2		216,313
Indiana	5,111,096	497,831	497,831	8			4,373,258	4,250,139	35	11		339,780	363,180			162	6
Iowa	5,600,679	1,507,566	1,460,776	40	4		3,568,132	3,531,469	59	5		691,074	574,080	11		8	34,814
Kansas	5,246,258	682,865	682,865	9		1	4,572,084	4,516,657	67	1		46,736	46,736	2		3	
Kentucky	3,672,347	265,336	265,336	7	1		2,463,277	2,123,595	13	2		134,304	134,304	1	3		1,009,203
Louisiana	3,813,467						1,447,148	1,447,148	14	1		966,512	922,046	8	3		844,272
Maine	1,926,861	493,350	493,016	12			584,695	584,103	8			81,675	81,675	1		2	268,066
Maryland	2,061,751						615,019	615,019	4	3		921,502	899,033	3	2	19	547,699
Massachusetts	4,210,833	197,672	197,672	2	1		2,634,481	2,634,481	19	2		382,770	382,770	2			995,910
Michigan	6,765,197	2,231,975	2,231,975	26	4		4,558,297	4,509,797	19	4							23,425
Minnesota	5,395,441	2,338,936	2,206,991	51	8	38	3,061,801	2,893,610	35	4	3	56,140	56,140		1	1	239,200
Mississippi	3,241,475	207,504	207,504	6	3		2,331,184	2,331,184	42		1	56,000	56,000	4		3	646,786
Missouri	6,142,153	308,981	308,981	6			5,695,929	5,499,685	46			367,252	253,300	1		2	80,187
Montana	2,722,327	2,250,014	2,250,014	32	6		403,583	403,583	5								68,730
Nebraska	3,556,441	1,441,856	1,440,533	55	1		1,588,885	1,588,885	23	1	5	434,876	434,876	5	1	20	92,147
Nevada	887,260	370,830	370,830	8			531,085	512,800	2	1		3,630	3,630			5	
New Hampshire	822,486	151,745	151,745	1	2		350,493	350,493	6	2	1						320,246
New Jersey	3,983,826	59,838	59,838		1		2,478,788	2,467,743	17	1		163,319	163,319	1	2		1,292,927
New Mexico	1,725,286	665,807	665,807	12			865,128	865,127	5	1		194,352	194,352	2			
New York	13,577,189	1,801,823	1,797,083	9	7		9,957,801	9,701,755	31	31		256,180	256,180		4		1,822,291
North Carolina	4,823,958	579,548	579,548	9	6		2,272,573	2,257,073	27	9		1,108,520	1,108,520	10	2	61	878,817
North Dakota	3,207,473	399,891	399,891	12			1,765,711	1,764,711	29	3		456,190	456,190	10	1		586,681
Ohio	8,439,897						4,393,231	4,179,991	27	3		3,202,400	3,019,096	17	4		1,220,810
Oklahoma	5,004,711	1,208,387	1,208,387	26	1		1,918,749	1,918,749	22	3		385,124	385,124	6	2		1,492,450
Oregon	2,334,804	562,923	562,923	7	3		1,804,273	1,722,133	9	3	1	38,350	38,350	1		1	10,798
Pennsylvania	11,483,613	390,198	338,959	17			6,341,869	5,798,369	42	15	9	2,221,625	2,218,877	11	3		3,132,806
Rhode Island	699,691	398,464	398,464	2	1		277,805	276,739	2	1							24,488
South Carolina	3,059,956	641,975	638,323	11	2	3	1,416,102	1,405,024	26	6		218,406	218,356		1	51	1,002,853
South Dakota	3,249,086	568,566	568,566	17	1	5	1,508,246	1,508,246	37	2	9	325,656	325,656	5	1	17	846,619
Tennessee	3,903,979	260,278	260,278	6		6	1,548,820	1,548,820	21	2	3	563,646	563,646	9	1	13	1,531,235
Texas	10,855,982	2,739,082	2,739,082	48	8		6,915,308	6,908,931	78	5		765,488	765,487	3	1	170	442,483
Utah	1,230,763	87,218	85,828	1	1		1,015,391	998,763	14			93,695	93,695	2			52,496
Vermont	729,857	461,762	457,629	7	5		804,074	187,995	1	1	9	64,345	34,745	2		5	99,288
Virginia	3,774,287	853,786	782,983	23	3		1,303,569	1,304,569	15	7		551,960	551,959	10	4	11	1,134,537
Washington	3,095,041	866,175	863,344	15	3	5	1,964,763	1,964,338	8	8		4,290	4,290			2	253,070
West Virginia	2,677,937						1,225,701	1,225,676	11	2		493,227	493,227	10	1	4	959,033
Wisconsin	5,082,683	1,661,704	1,661,704	21	2		2,785,641	2,720,560	16	4		536,470	475,000		1		165,418
Wyoming	1,360,881	251,237	251,131	4			861,106	828,101	8								281,609
Dist. of Columbia	410,804					*	425,504	396,804	3								14,000
Hawaii	453,703						522,380	453,703	5								
TOTALS	196,000,000	37,507,610	37,045,002	648	89	62	111,613,591	109,016,343	992	157	42	20,825,969	20,233,199	185	43	615	29,705,456

hard surfacing. A comparison of the status of the system on June 30, 1935, and June 30, 1936 is as follows:

Completed:	June 30, 1936 (Miles)		June 30, 1935 (Miles)	
Standard Pavement	2,417.69		2,400.82	
Bituminous Surfacing	1,724.01		1,545.112	
Improved Earth Type	1,141.73		1,243.05	
Sub-totals		5,283.43		5,188.982
Incomplete Portions	June 30, 1936		June 30, 1935	
Projects Under Contract:	(Miles)		(Miles)	
Standard Paving	19.51*		.1	
Bituminous Surfacing	37.76		172.674	
Improved Earth Type	147.72		11.6	
Sub-totals		187.48		184.374
Unimproved		666.70		633.15
Totals		6,137.61		6,006.506

*Includes 17.51 miles of widening existing pavement and relocations of existing pavement. The totals include this mileage in "Completed Standard Pavement."

The total expenditures for construction for the year was $3,288,771. Expenditures for maintenance amounted to $1,733,618.

The 1936 General Assembly authorized a two-year construction program estimated to cost approximately $9,500,000. Funds for this program are provided from state bonds and regular Federal Aid for the years ending June 30, 1936, and June 30, 1937. Over 50 per cent of the projects for this program have been let to contract and others will be let just as rapidly as plans are completed. A summary of the projects, for which funds have already been provided, to be let as soon as plans are completed, is as follows:

Federal Aid and State Projects authorized by 1936 General Assembly	$4,000,000.00
Federal Works Program Highway and Grade Crossing Projects	1,200,000.00
Other projects to be financed pursuant to reimbursement agreements with counties	800,000.00
Total	$6,000,000.00

Florida

Up to Dec. 1, 167 miles of paving had been completed, partially overlapping 138 grading miles. The total cost road and bridge construction to the above date was $7,961,115. Probable Federal Aid expenditures in 1937 will be $5,403,516, calling for approximately 90 miles paving and 33 overlapping grading miles and bridge construction. Information on state fund expenditures and mileage not available at present.

J. H. Dowling, Tallahassee, Fla., is State Highway Engineer.

EAST SOUTH CENTRAL DIVISION

Kentucky

State highway completed in 1936 amounted to 405 miles costing approximately $9,000,000, including bridges. Probably mileage for 1937 is 500 and the possible expenditure is $7,000,000.

T. H. Cutler, Frankfort, Ky., is Chief Engineer State Highway Commission.

Tennessee

Construction completed in 1936 includes 75 miles grading and drainage costing $2,257,000; 140 miles pavement costing $4,900,000; railroad crossing flashing lights, gates and protective devices, $42,000.

The construction mileage and expenditure for 1937 depends upon funds provided by the state legislature which convenes in January.

O. F. Goetz, Nashville, Tenn., is State Highway Engineer.

Status of U. S. Works Program Highway Projects (as Provided by the Emergency Relief Appropriation Act of 1935), as of Nov. 30, 1936

Compiled by U. S. Bureau of Public Roads

STATE	APPORTIONMENT	COMPLETED			UNDER CONSTRUCTION			APPROVED FOR CONSTRUCTION			BALANCE OF FUNDS AVAILABLE FOR NEW PROJECTS
		Estimated Total Cost	Works Progress Funds	Miles	Estimated Total Cost	Works Progress Funds	Miles	Estimated Total Cost	Works Progress Funds	Miles	
Alabama	$ 4,151,115	$ 954,131	$ 954,131	51.0	$ 3,050,432	$ 3,050,432	78.5	$ 68,086	$ 68,086	8.7	$ 78,465
Arizona	2,569,841	2,495,172	2,184,031	161.8	563,100	336,434	27.2				49,375
Arkansas	3,352,061	2,150,988	2,133,168	208.9	1,126,473	1,124,671	138.2	55,329	55,221	11.9	39,001
California	7,747,988	4,804,519	4,623,801	197.3	2,998,628	2,975,468	56.7	69,672	69,672	1.2	78,987
Colorado	3,395,263	1,892,021	1,885,876	93.1	239,486	239,469	11.0				1,270,518
Connecticut	1,418,709	166,679	159,804	.2	619,224	581,031	8.6	294,306	294,306	8.9	383,567
Delaware	900,310	183,996	180,518	53.3	575,071	467,425	89.5	106,430	106,420	4.0	145,946
Florida	2,597,144	769,624	769,624	34.4	1,712,444	1,712,444	64.3	70,781	70,781	.4	44,294
Georgia	4,388,367	439,350	438,662	29.0	660,818	660,818	42.3	469,634	469,634	33.9	3,419,851
Idaho	2,222,747	1,739,499	1,692,671	145.6	510,235	490,340	37.7	21,660	21,660	2.4	17,876
Illinois	8,694,009	6,488,432	6,454,609	357.8	2,005,885	2,005,885	96.7	219,610	219,610	16.6	13,905
Indiana	4,941,895	1,235,367	1,232,669	59.7	3,828,728	3,606,823	168.8	37,984	37,984	6.3	61,843
Iowa	4,591,664	2,129,684	2,043,503	306.4	3,076,433	2,328,589	205.8	72,044	18,200	7.0	1,376
Kansas	4,594,575	1,979,998	1,979,717	211.3	3,024,996	3,019,184	163.8				74
Kentucky	3,726,271	1,732,303	1,726,277	236.1	1,328,606	1,328,606	105.6	355,705	355,695	8.1	221,631
Louisiana	2,890,429	939,694	608,230	53.5	1,851,075	1,656,642	104.8	335,053	275,018	16.4	158,539
Maine	1,676,799	1,171,746	1,170,514	89.9	505,583	505,583	20.5	64,600	64,600	2.5	16,161
Maryland	1,750,738	186,296	186,296	10.7	661,961	621,593	113.0	606,484	502,958	17.9	437,896
Massachusetts	3,862,885	117,754	117,754	1.1	2,034,905	2,034,905	16.6	856,377	503,016	.7	607,210
Michigan	6,301,814	5,156,800	5,096,870	284.3	1,046,421	1,046,421	43.6	203,200	158,200	4.8	583
Minnesota	5,277,145	5,271,518	5,218,675	306.1	1,279,576	876,731	95.8	163,066	130,198	8.5	49,582
Mississippi	3,457,552	1,530,341	1,526,274	116.7	1,555,771	1,554,802	88.3	315,059	315,059	27.1	61,817
Missouri	6,012,652	3,851,099	3,219,982	685.8	2,405,620	2,289,863	90.2	602,777	435,632	1.7	67,175
Montana	3,676,816	3,261,295	3,260,629	184.7	371,674	363,706	10.6				52,083
Nebraska	3,870,739	1,966,679	1,922,319	202.5	1,579,504	1,578,000	155.2	118,088	118,088	12.2	252,333
Nevada	2,243,076	1,686,964	1,636,081	79.5	336,756	336,756	16.0	2,738	2,738	.3	267,698
New Hampshire	995,225	491,748	476,066	26.3	250,796	250,783	8.3	89,423	87,975	1.8	130,461
New Jersey	3,129,805	571,768	571,769	13.2	2,287,721	2,271,566	15.9	207,045	198,076	4.7	88,394
New Mexico	2,871,397	2,037,358	2,036,654	156.7	605,318	605,318	36.1	156,277	156,277	5.8	73,148
New York	11,046,377	6,148,781	5,868,919	116.5	4,976,630	4,848,730	51.4	328,700	328,700	2.5	6,088
North Carolina	4,780,173	1,282,143	1,282,143	85.0	3,069,133	3,036,944	182.7	300,671	234,131	19.4	167,355
North Dakota	2,867,894	1,208,148	1,200,622	182.7	1,298,432	1,298,997	122.9	154,511	154,511	20.2	217,115
Ohio	7,670,815	2,233,873	2,210,463	78.4	4,278,796	4,156,035	147.7	1,045,319	1,068,105	65.4	236,218
Oklahoma	4,580,670	1,597,823	1,587,446	137.9	1,904,258	1,902,575	198.8	769,949	757,963	46.3	332,687
Oregon	3,038,642	1,960,160	1,941,326	148.5	1,253,621	898,185	8.8	69,298	69,998	9.5	135,139
Pennsylvania	9,347,797	1,296,303	1,234,644	67.6	1,953,278	1,949,240	57.9	2,117,071	2,116,182	69.2	4,047,731
Rhode Island	989,808	730,630	720,034	15.4	259,501	259,501	3.4	9,673	9,673		
South Carolina	2,702,012	739,721	703,539	79.3	1,480,601	1,421,787	131.2	271,363	254,009	19.1	322,676
South Dakota	2,976,455	1,627,862	1,627,862	342.1	897,926	897,926	100.4	307,147	307,147	39.1	143,519
Tennessee	4,192,460	1,556,721	1,554,796	71.8	1,496,888	1,496,888	51.9	506,607	506,607	18.4	634,169
Texas	11,989,350	9,515,614	8,624,872	868.5	3,534,481	3,230,556	243.4	188,047	89,975	10.0	43,948
Utah	2,067,158	1,351,522	1,222,977	150.4	672,601	641,237	35.6	112,860	112,860	5.0	90,080
Vermont	924,306	784,678	687,532	18.8	237,731	193,455	3.0	33,020	19,910	.4	23,410
Virginia	3,652,667	2,602,386	2,526,123	829.8	767,689	767,509	180.9	189,806	189,806	31.8	169,230
Washington	3,086,161	2,449,980	2,220,078	155.2	838,107	692,716	8.3	92,098	92,098	1.2	21,269
West Virginia	2,231,418	198,382	194,382	11.8	1,801,289	1,797,745	67.9	128,465	127,732	10.3	111,553
Wisconsin	4,823,884	4,600,405	4,115,575	309.8	907,340	678,183	31.5	2,030	2,030	2.9	8,156
Wyoming	2,219,155	1,380,460	1,380,461	109.0	820,398	820,598	31.1				38,184
District of Columbia	949,496	909,101	909,101	5.5	46,898	21,660	.4				18,735
Hawaii	926,033	843,307	228,809	4.0	401,855	395,897	4.9	54,422	53,884	1.5	248,044
TOTALS	195,000,000	109,874,688	96,713,695	8,543.1	75,057,883	71,931,196	3,613.9	12,323,050	11,250,356	580.1	15,104,793

Alabama

For the past year the construction of paved road mileage has been accelerated to a marked extent. 691 miles of paved highways have been constructed on the state highway system within the past twelve months, bringing the total miles paved on the Alabama System to 2,668 miles. The State system is now 41 per cent paved. The amount of mileage paved in the last eight years is 1,851 miles, of which 37 per cent has been completed within the past 12 months.

The total expenditure for Alabama highway activities by the State Highway Department for the fiscal year 1935-1936, was $14,969,116.

Of the above amount $9,118,251 was expended for construction; $1,928,097 for maintenance; $562,914 for the purchase of equipment; $2,474,986 for interest and retirement of highway bonds. Other activities of the Highway Department, such as highway patrol, construction of convict camps, construction of highway building, state-wide planning survey, testing laboratory, aid and advice to counties and municipalities, warehouse and shops and administrative charges brought the total to the above approximate fifteen million dollars.

Roads constructed by the state highway department (1935-1936), including all construction activities, convict, state, state in cooperation with counties and the Bureau of Public Roads, during the last year amounted to the following estimated amounts: 62 miles of concrete paving, 629 miles of bituminous pavement, 463 miles of gravel, chort, sand-clay, etc., and approximately 77 miles of graded and drained roads. The mileage classed as unimproved roads on the state highway system was decreased during the year by 248 miles.

The total road mileage within the state for rural roads has been for many years questionable; however, through a recent State-wide Planning Survey, information has been secured that reveals the most accurate record that has been made to this date. This record indicates that Alabama has 61,118 miles of roads shown by actual road inventory. The state highway system consists of 6,470 miles of the total road mileage.

Table I gives the anticipated receipts and disbursements for the Alabama State Highway Department for the fiscal year beginning October 1, 1936. This statement includes Federal and State funds. It will be noted that it is anticipated that only $836,064 of regular Federal-aid will be used, as revenues are not adequate to match remaining Federal-aid available, which amounts to $4,372,223. The 1936-1937 program as anticipated at this date will be one of the smallest construction programs in the history of the State Highway Department unless the remaining available Federal-aid is matched.

TABLE I

STATE HIGHWAY DEPARTMENT OF ALABAMA

CONSOLIDATED STATEMENT
Anticipated Receipts and Disbursements
Fiscal Year
October 1, 1936-September 30, 1937

Receipts	
Unobligated Balance 10-1-36	$ 71,446
Revenue	
Gasoline Excise Tax	$6,000,000
Motor Vehicle License	2,500,000
Motor Carrier Fees	150,000
Miscellaneous	350,000
Disbursements	
Fixed Charges—	
Lease Alabama Bridge Corp.	$ 275,000
Interest and Sinking Fund—1st Issue Bonds	1,234,780
Interest and Sinking Fund—2nd Issue Bonds	1,490,555
Operation	
Administration	$ 300,000
Construction	2,200,000
Maintenance	2,000,000
Regular Federal Aid Program Submitted	836,064
Contingencies	300,000
Unobligated Balance	$ 435,047
Federal Aid Apportionment—	
Balance Available Expiring June 30, 1937	$1,768,256
Available Expiring June 30, 1938	2,603,967
Total Available for matching State Funds	$4,372,223

H. H. Houk, Montgomery, Ala., is Chief Engineer State Highway Department.

Mississippi

During 1936 the State Highway Department let contracts for approximately 800 miles of grading and drainage costing approximately $12,000,000, this grading and drainage including bridging. Paving contracts have totaled approximately 400 miles at a cost of approximately $10,000,000. It is estimated that 40 or 50 per cent of this work will be carried over into 1937 before final completion.

The approximate amount of money available during 1937 includes $23,000,000 for construction, $1,500,000 for maintenance and $1,000,000 for miscellaneous purposes. The sources of money are:

Federal Funds (Hayden-Cartwright Bill)	$ 2,200,000
P. W. A. Loan—Grant	20,150,000
State Funds—State Gas Tax	3,000,000
Vehicle License Fees	150,000

There will be approximately 400 miles of grading done costing $5,000,000 and involving approximately 8,800,000 cu. yds. of excavation. Approximately 700 miles of high type paving will be constructed at an approximate cost of $15,800,000. Approximately 150 bridges will be built costing $2,000,000.

R. A. Harris, Jackson, Miss., is Chief Engineer State Highway Department.

WEST SOUTH CENTRAL DIVISION

Arkansas

Contract awards for state highways totaled $6,000,000, consisting of 52 miles concrete pavement, 51 miles asphaltic surfacing, 49 miles stone or gravel base course, 241 miles gravel surfacing, 303 miles grading and 10,000 lin. ft. of bridges. Details of the 1937 program are not available at this time.

J. C. Baker, Little Rock, Ark., is State Highway Director.

Louisiana

Expenditures in 1936 under direction of State Highway Commission amounted to $25,768,961, of which $22,268,961 was for highway and bridge construction and $3,500,000 for maintenance. The mileage built in 1936 totaled 1,595.4 and included the following:

	Miles
Graded and Drained	47.1
Gravel Surfaced	1,356.3
Bridges and Grade Separations	4.0
Asphalt Surface Treatment	42.5
Concrete	145.5

A total of 350.2 miles was under construction at the end of the year, the mileage on the various types being as follows:

	Miles
Graded and Drained	29.9
Gravel Surfaced	251.4
Bridges and Grade Separations	3.1
Asphalt Surface Treatment	11.0
Concrete	54.8

The estimated expenditure for 1937 are $22,600,991 and the proposed new construction includes the following:

	Miles
Graded and Drained	55
Gravel Surfaced	640
Asphalt Surface Treatment	20
Concrete	260

In addition it is proposed to contract 1937 limit of bridges to cost $9,600,000.

The paving of the remaining gaps in the hardsurfacing highway program is rapidly being accomplished by the Louisiana Highway Commission. The year 1936 was featured by the completion of the combination highway and railroad bridge over the Mississippi River at New Orleans, which was constructed at a cost of $14,000,000, contributed jointly by the Highway Commission and the railroads.

Among other projects undertaken or completed in the past year, were the Sicard Overpass and Approaches, the Ouachita River Bridge at Monroe and the new paved route through Monroe on U. S. Route 80. These improvements complete the Dixie-Overland Highway as a through all-paved route across Louisiana from Mississippi to Texas.

The New Orleans-Jackson, Mississippi Highway (U. S. Route 51) is now completely hardsurfaced from New Orleans to the Mississippi State Line, pavement having been finished on the nine mile section north of Tangipahoa.

The Rigolets-Pearlington Cut Off, which shortens the length of the New Orleans-Gulf Coast Highway (U. S. Route 90) by twenty miles was surface treated in 1936 and offers the motorist a through, paved short cut route between New Orleans and the Mississippi Gulf Coast.

Also to be listed among the major accomplishments of the year were the completion of the Red River Bridge at Alexandria, the T&P Overpass at Livonia, and the pavement between Krotz Springs and LeBeau, all of which are on U. S. Route 71.

In addition to the above many other important road and bridge projects were completed during the year 1936.

Harry B. Henderlite, Baton Rouge, La., is State Highway Engineer.

Texas

Construction contracts let in the fiscal year ending Aug. 31, 1936, are as follows:

Type	*Mileage*	*Cost*
Landscape projects	....	$ 196,092
Grading and small structures	1,295	10,742,942
Gravel, caliche, etc., surface	1,048	6,395,786
Asphalt surface	1,123	8,908,489
Concrete and brick	301	8,047,199
Large bridges	....	8,098,451
Overpasses and underpasses	....	9,236,884
Total	3,767	$51,625,846

Construction completed in the fiscal year ending Aug. 31, 1936, follows:

Type	*Mileage*	*Cost*
Landscape projects	....	$ 190,175
Grading and small structures	787	9,133,151
Gravel, caliche, etc., surface	468	3,344,680
Asphalt surface	968	7,667,608
Concrete and brick	320	8,290,245
Large bridges	....	1,181,270
Overpasses and underpasses	....	1,672,760
Total	2,543	$31,479,891

Construction projects active on Aug. 31, 1936, are:

Type	*Mileage*	*Cost*
Landscape projects	....	$ 105,118
Grading and small structures	594	7,427,741
Gravel, caliche, etc., surface	495	3,502,740
Asphalt surface	698	6,429,273
Concrete and brick	121	3,710,472
Large bridges	....	7,664,962
Overpasses and underpasses	....	9,822,379
Total	1,908	$38,662,688

Because of the large amount of construction placed under contract during the past year, and because of the large number of projects now active, the majority of which are WPA projects and which it was necessary to supplement with State funds, the present fiscal year finds the highway department with state funds to match the 1937 Regular Federal Aid funds and very little else. The 1937 Regular Federal Aid program for Texas consists of $7,771,317 in Federal funds, and the same amount of state funds, making a total of $15,542,634. State projects in this year will not exceed $2,000,000.

The 1937 Regular Federal program which has been approved by the Bureau of Public Roads under which the first projects were let in the month of November consists of the following types of work:

Type	*Miles*
Grading and small structures	
New work and widening present grade	549
Gravel, caliche, etc., surface	300
Asphalt surface	258
Concrete and brick surface	205
Landscape projects	10
	1,322
Large bridges	13

The 1938 Regular Federal Aid programs, the apportionment of which has not been made and upon which the money will be available July 1, 1937, will be as follows for the state of Texas:

	Federal	*State*
Regular	$ 7,771,317	$7,771,317
Secondary or Farm-to-Market	1,560,000	1,560,000
Grade separation	2,710,000	.....
	$12,041,317	$9,331,317
Total	$21,372,634	

Several of the outstanding contracts let in the past fiscal year were a new Galveston causeway on Highway No. 16 leading north from Galveston toward Houston, the estimated cost of which is $2,000,000. Contracts have also been let on a bridge across the Neches River on Highway No. 87 between Port Arthur and Orange, and this bridge will cost $2,500,000.

Included on the 1937 Regular Federal Aid program are the completion of a number of gaps in the main highways.

Grading and drainage structures on 58 miles of Highway No. 3 between Marfa and Van Horn and the subsequent surfacing of same will close the last gap in the highway. The surfacing of Highway No. 40 through Montague and part of Cooke Counties, 40 miles in length, will complete Highway No. 5 across the state. 52 miles of grading and drainage structures and the surfacing of Highway No. 13 across Oldham and Deaf Smith Counties will complete Highway No. 13 across the state. 36.5 miles of grading and drainage structures on Highway No. 33 across Parmer County will take care of the last unimproved section of this highway.

Gibb Gilchrist, Austin, Tex., is State Highway Engineer.

MOUNTAIN DIVISION

Montana

The following tabulation shows the work completed and accepted by the State Highway Commission in 1936:

WORK COMPLETED AND ACCEPTED IN 1936

Type *Roadway*	7% Miles	Feeder Miles	Total Miles
Conc. Pave.	1.095	0.841	1.936
Asph. Pave.	2.473	0.823	3.296
P. M. Oil	11.239	4.002	15.241
R. M. Oil	219.904	1.467	221.371
Penetration	102.611	0.859	103.470
Gravel Surfacing	274.824	125.173	399.997
Grading	270.649	128.941	399.590
Bridge	Feet	Feet	Feet
Steel	2,992.90	177.00	3,169.90
Steel and Conc.	1,657.87	706.33	2,364.20
Steel and Tbr.	557.08	362.50	919.58
Concrete	3,586.62	414.20	4,000.82
Timber	5,405.33	2,677.58	8,082.91
Total	14,199.80 = 2.689 mi.	4,337.61 = 0.821 mi.	18,537.41 = 3.510 mi.
Cost	$7,799.214	$2,691,105	$10,490,319

WORK UNDER CONTRACT CARRIED OVER TO 1937

Type *Roadway*	7% Miles	Feeder Miles	Total Miles
Conc. Pave.	0	0	0
Asph. Pave.	0	0	0
P. M. Oil	14.759	0	14.759
R. M. Oil	138.041	0.535	138.576
Penetration	5.304	0	5.304
Gravel	180.774	10.558	191.332
Grading	119.324	0.535	119.859
Bridges	Feet	Feet	Feet
Steel	104	503.2	607.2
Steel and Conc.	1141.3	43.0	1184.3
Steel and Tbr.	0	0	0
Concrete	167.75	0	167.75
Timber	1151	0	1151.00
Total	2564.05 = 0.486 mi.	546.20 = 0.103 mi.	3110.25 = 0.589 mi.
Estimated Cost	$3,048,791	$270,909	$3,319,701

Work carried over to 1937 amounts to approximately $2,000,000. The probable expenditures for 1937 are as follows: Approximately $2,000,000 for maintenance, $4,500,000 for highway construction under contract and about $750,000 for grade separation projects. Of this amount approximately $3,250,000 will be furnished by the federal government and the balance by the state from the gasoline tax.

D. A. McKinnon, Helena, Mont., is State Highway Engineer.

Idaho

State highway construction costing $7,969,328 was completed in 1936, the work including the following:

Construct roadbed and drainage structures, miles—64.021	$ 782,260
Grade, drain and surface with crushed rock or gravel. Miles—206.604	2,613,917
Grade, drain, surface and oil. Miles—16.587	242,547
Crushed rock or gravel surfacing. Miles—65.238	367,165
Plant mix oiling. Miles—97.476	925,762
Road mix oiling. Miles—134.337	337,051
Seal coating. Miles—53.800	43,260
Bituminous mat and crushed rock shoulders. Miles—16.480	196,032
Grade, drain and concrete paving. Miles—2.363	92,944
Underpasses. Each—2	235,006
Overheads. Each—15	1,054,643
Concrete bridges—major structures. Each—8	586,776
Steel bridges—major structures. Each—1	96,750
Timber bridges—major structures. Each—2	7,427
Riprapping. Cubic Yards—59,000	71,710
Stock Pile Gravel	45,959
Co-operation with local units	126,028
Widening roadway. Miles—14.368	29,665
Miscellaneous—painting and repairing bridges, guard rail fences, channel changes, flood control, roadside beautification, etc., not included above	114,414
Total	$7,969,328

Uncompleted work estimated to cost $1,169,323, carried over to 1937 includes the following:

Grade, drain and surface with crushed rock or gravel, miles, 22.748	$ 340,361
Grade and drain, miles, 3.441	40,007
Plant mix oiling, miles, 43.860	486,670
Paving macadam and concrete, miles, 8.907	178,423
Underpasses, each, 2	123,862
Total	$1,169.323

The estimated amount available for new construction and maintenance in 1937 is as follows:

Construction—	
State funds—matching	$1,442,000
Federal Aid funds	2,163,000
Federal Lands	185,000
Other funds (Works Program)	415,000
Subtotal	$4,205,000
Maintenance—	
State funds	$1,500,000
Total	$5,705,000

At this time, it is not possible to estimate the various types and mileage for the 1937 construction.

J. H. Stemmer, Boise, Idaho, is Director of Highways.

Wyoming

During 1936 there has been put under contract or authorized for construction, work amounting to approximately $4,335,000. The funds for this work are shown in the following table:

WORK PUT UNDER CONTRACT IN 1935

National Recovery Funds	$ 35,000
Federal Aid Funds (including state funds to match)	1,900,000
Works Program Highway Funds	1,400,000
Works Program Grade Crossing Funds	900,000
State Funds	100,000
Total	$4,335,000

There were 68 contracts awarded consisting of:

182 miles of grading and bridge work	$2,100,000
46 miles of base course surfacing	140,000
208 miles of oiling	1,165,000
3 railroad under passes	465,000
1 railroad crossing elimination by relocation	100,000
Total	$4,335,000

This work is now all complete except approximately $1,700,000 worth of work which is under contract and will be finished early in 1937. It is anticipated that there will be available for construction work to be authorized or put under contract during 1937 the following amounts:

120 miles of grading and bridge work	$1,750,000
235 miles of oiling (including base course)	1,630,000
43 miles of base course surfacing	300,000
2 underpasses	340,000
3 overheads	250,000
Total	$4,270,000

Balances of old funds listed above programmed but not put under contract are $1,330,000. Federal Aid funds to be allotted at the beginning of the year together with State funds necessary to match, $2,600,000. Grade crossing funds expected to be allotted the first of the year are $340,000.

These funds have not been programmed for construction, but it is expected that the program to be adopted will provide contracts to be let about as follows:

Construction—Old Funds	$1,330,000
Federal Aid and State Funds to Match	2,600,000
Grade Crossing	340,000
Total	$4,270,000

In addition to the above there will be approximately $600,000.00 State and Federal Funds available for sec-

ondary road construction provided the forthcoming legislature decides to provide for State funds to match the secondary Federal Aid money. There was spent in 1935 for maintenance between $650,000 and $770,000 and it is anticipated that approximately the same amount will be used in 1937.

Jas. B. True, Cheyenne, Wyo., is Superintendent-Engineer State Highway Department.

New Mexico

State highway construction completed in 1936, including Federal Aid, National Recovery, Works Program Highway and Works Program Grade Crossing projects was as follows:

	Miles
Grade and drain	95
Grade, drain and surfacing	256
Grade, drain, oil process and rock asphalt top	16
Oil process and rock asphalt top	84
Surfacing only	41
Grade, drain and rock asphalt	7
Oil processing	24
R. R. grade crossing elim. structures	4
Landscaping	2
Total	529
Total Estimated Cost	$7,315,500

Additional state work	Miles
Single penetration	24
Oil processing	158
Total	182
Total Cost	$456,000

The total estimated cost of the work carried over into 1937 is $2,170,500, involving the following:

	Miles
Grade, drain and surfacing	64
Surfacing	53
Grade, drain and oil process	8
Oil process	27
Oil process and rock asphalt top	41
R. R. grade crossing elim. structures	1
Landscaping	4
Total	198

Improvements tentatively scheduled for 1937 include:

107 miles of grading, drainage and base surfacing

130 miles of bituminous surfacing

The above are 1938 Federal Aid and Federal Lands.

New Mexico's program of grade crossing eliminations and secondary road improvements has not yet been selected, even tentatively.

From old programs, work to be constructed in 1937 includes:

38 miles of grading, drainage and base surfacing

7 miles of bituminous topping

3 landscaping projects

The estimated funds available for 1937 construction are:

Old program funds (Federal and State)	$ 697,000
1938 Federal Aid	2,000,000
State match funds for F. A.	1,250,000
1938 Federal lands	200,000
1938 Grade crossing	430,000
1938 Secondary	400,000
State match funds for secondary	400,000
Total	$5,377,000

The above may be augmented by additional funds for State construction through additional funds authorized by the State legislature.

G. F. Conroy, Santa Fe, N. M., is State Highway Engineer.

Utah

Approximately $5,800,000 will be available for state highways in 1937. Of this sum over $4,000,000 will go for construction, $1,300,000 for maintenance and $500,000 for other purposes.

The sources of these funds are as follows:

Federal Funds

Carry Over—	$ 700,000
1. Hayden-Cartwright	1,400,000
2. Other	900,000
State Funds	
1. State Gas Tax	2,800,000
2. Vehicle License Fees and Other	.....

The 1937 construction funds will be expended for the following purposes:

	Miles	Amount	Quantities Required
Grading	150	1,000,000	*2,000,000
Surfacing—			
1. Gravel or Crushed Stone	60	420,000	†540,000
2. Oil Treatment	120	475,000	.....
3. Paving, High Type	15	600,000	.....
4. Paving, Low Type	25	350,000	.....
	No.		
Bridges	25	1,155,000	.....

*Yards. †Tons.

E. C. Wright, Salt Lake City, Utah, is Chief Engineer State Road Commission.

Nevada

Highway appropriations for the fiscal year 1936 were practically expended or were under agreement for projects under construction early last fall. Consequently, no additional construction can be carried on from 1936 funds. Nevada's regular Federal Aid allotment of funds for the fiscal year 1937 amounts to approximately $1,600,000.

These funds, authorized by the Hayden-Cartwright Act of Congress of 1934, must be matched with state funds to the extent of 13.43 per cent and are applicable to construction and reconstruction of the Federal Aid System of Highways which comprises the greater part of the main trunk highways in Nevada.

The accompanying table shows the various types of construction work contemplated under this program, together with their respective estimated costs and mileages. It should be particularly noted that this program embraces the fiscal year of 1937 (July 1, 1936 to June 30, 1937) rather than the calendar year. At the date of writing (Dec. 23) approximately 30 per cent of the total appropriation has been expended on completed projects or is under agreement for the projects being constructed. Much of the remainder will be placed under construction within a short time.

Projects thus far completed with 1937 federal aid funds include approximately 100 miles of roadmix asphaltic surface, bridge approaches within the city of Winnemucca and the installation of pit scales for traffic survey. A large portion of the remaining program for the fiscal year 1937 will be placed under contract shortly after the first of the new year.

For the fiscal years 1938 and 1939, the Hayden-Cartwright Act of 1936, passed by Congress in 1936, provides for the appropriation of approximately $200,000,000 throughout the nation for highway construction for each of these fiscal years. The allotment to Nevada for each of these years will be approximately as follows: Federal Aid, $1,595,000; Federal lands, $553,000; Feeder roads, $320,000; Grade crossing elimination, $220,000.

These funds become available for use on July 1, 1937, and can be placed under agreement as early as Jan. 1,

1937; thus insuring uninterrupted construction progress on Nevada's System of Highways.

MILEAGE BY ROAD TYPES COMPLETED DURING THE CALENDAR YEAR 1936—STATE OF NEVADA, DEPARTMENT OF HIGHWAYS

	Miles
Grading (Only)	7.71
Select Material Surface	7.98
Crushed Gravel	314.25
Roadmix Surface (Only)	244.31
Const. and Roadmix Surface	25.39
Plantmix Surface (Only)	....
Const. and Plantmix	6.69
Asphaltic Concrete	4.86
Portland Cement Concrete	....
Composite	0.58
Grand Total of all Contracts Let	611.77
Miles Under Construction	37.27
Miles of highway on which landscaping work was done	90
Number of Overpasses Completed	7
Number of Underpasses Completed	3
Number of Bridges Completed	4

TENTATIVE CONSTRUCTION PROGRAM FOR THE FISCAL YEAR 1937, JULY 1, 1936, TO JUNE 30, 1937

Work Proposed	Miles	Cost
Realign, Widen and Gravel Surface	15.00	$225,000.00
Roadmix Asphaltic Surface	88.33	213,112.32
Realign, Widen and Roadmix Asphaltic Surface	26.00	258,767.73
Realign, Widen and Plantmix Asphaltic Surface	34.37	961,400.00
Overpass Grade Separation and Approaches	0.28	30,000.00
Underpass Grade Separation and Approaches	1.00	21,947.56
Bridge Approaches	0.66	70,000.00
Install Pit Scales for Planning Department	....	15,000.00
State Wide Rural Planning	....	27,618.89
Roadside Beautification	5.11	18,412.18
Total Cost (1937)		$1,841,259.18

Robert A. Allen, Carson City, Nev., is State Highway Engineer.

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PACIFIC DIVISION

Washington

The following is the classification and amount of work contracted during 1936:

Type of Construction	Length, Miles	Value
Grading and Surfacing	223.7	$2,380,968.79
Bridges	3.3	1,736,887.66
Cement Concrete Pavement	52.7	2,179,574.15
Light Bituminous Surface Treatment	40.0	25,834.60
Bituminous Retread	149.5	134,760.12
Asphaltic Concrete	9.3	225,681.25
Heavy Oil	70.5	492,174.70
Miscellaneous	...	146,265.47
		$7,322,146.74

The value of the uncompleted work carried over into 1937 is as follows:

Type of Construction	Value
Grading and Surfacing	$1,097,140 00
Bridges	814,111.00
Cement Concrete Pavement	461,538.00
Asphaltic Concrete	29,811.00
Heavy Oil	279,211.00
	$2,681,811.00

Eighteen of the construction projects programmed in 1936 have not yet been let. These consist of 1.9 miles of grading and surfacing, 1.9 miles of bridges, 11 miles of paving, and several roadside improvement projects. The value of these 1936 projects to be let early in 1937 is about $1,738,000.

Inasmuch as specific appropriations for state highway construction will be made by the coming legislature, which convenes in January, 1937, it is impossible at this time to outline in detail the projects which will be undertaken during the year 1937. However, upon the basis of the present laws relating to the distribution of motor vehicle fees and gas tax collections, which may or may not be revised by the next legislature, the state revenue available for legislative appropriation for construction purposes on the state highway system, together with the Federal Aid allotment to the State of Washington for construction purposes on the Federal Aid system, will amount to approximately $4,500,000.

In addition, the value of the reconstruction of low cost bituminous surfaces, together with the new work of similar character which is not eligible for federal participation, will amount to $750,000. Federal allotments (other than Federal Aid) for the coming year are as follows: Grade separation projects, $750,000; Farm to Market and Feeder roads, $375,000. The latter is required to be matched on a 50-50 basis with local Secondary Highway funds.

L. V. Murrow, Olympia, Wash., is State Highway Commissioner.

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Oregon

Construction expenditures in 1936 under the direction of the State Highway Commission totaled $11,000,000 and included the construction of 35 miles pavement, 25 miles bituminous macadam, 260 miles oil treatment, 180 miles rock surfacing and 130 miles grading; also 17 grade separations and 36 bridges.

Probable construction expenditures for 1937 are $10,500,000 and approximately one-half of the 1937 work is already under contract.

The 1937 program includes the following:

Pavement	40 miles
Bituminous Macadam	80 miles
Oil Treatment	210 miles
Rock Surfacing	200 miles
Grading	200 miles
Grade Separations	10
Bridges	30

R. H. Baldock, Salem, Ore., is State Highway Engineer.

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California

Major contract construction placed underway from Jan. 1 to Dec. 31, 1936, was as follows: Portland cement concrete, 117 miles, $4,213,000; asphalt concrete, 104 miles, $3,496,000; bituminous treated crushed rock surface, 363 miles, $8,294,000; untreated crushed rock surface, 83 miles, $1,236,000; graded roadbed, 117 miles, $1,934,000; roadbed and shoulder oiling and seal coat, 1,526 miles, $1,720,000; bridges and grade separations, 82, $3,325,000; tunnel and miscellaneous contracts $966,000. Total major contract construction was $25,186,000, maintenance for 1936 cost approximately $9,500,000. Construction remaining to be placed under way by July 1, 1937, for current biennium, $4,069,000.

Budget for coming biennium July 1, 1937, to June 30, 1939, to be submitted to legislature in January for adoption includes major construction state funds $22,500,000, Federal Aid $9,500,000, Federal funds for grade crossings, $3,700,000, and secondary roads, $1,900,000, construction and maintenance on state highway routes in cities, $7,250,000, construction and maintenance on state system, $16,500,000. Total $61,350,000.

C. H. Purcell, Sacramento, Calif., is State Highway Engineer.

COMPARATIVE INFORMATION ON ROAD-BUILDING EQUIPMENT

MANY TIMES engineers or contractors have discussed equipment or considered an outfit setup for certain kinds of road, street or bridge work. Their preliminary investigations brought up questions on equipment that they could not answer because they did not have manufacturers' catalogs available. In many cases the advertising of equipment carried no data by which the individual could make comparisons. The following tables are published to give information that will help in these circumstances. They are certainly not to be considered as complete specification material and in the cases of some equipment not even all manufacturers are included. We tried to get all but to rate 100 per cent is next to impossible. Manufacturers were requested to supply the information. After it was assembled proofs were sent to them for correction or approval. Their noted corrections were made and the data assembled in tabular form. We ask that those tables be not used for selecting equipment but more for a guide in discussions and we urge that all manufacturers be contacted in cases where purchase of new equipment is involved. That is only a natural request because specifications on newer units change frequently and what is listed here may not be the latest at the time that the table is used. Furthermore, we have in mind one concern that expects to announce a new line of large wheel scrapers. They are not listed under that heading. The Galion Iron Works and Mfg. Co. who makes a line of road building equipment is not cataloged under any of the units they manufacture. We thought best to publish what we had rather than wait to get a complete cataloging.

Because of the volume of this material we must withhold part of it for publication in subsequent issues.

Concrete pavers and construction mixers have been standardized by the Mixer Manufacturer's Bureau. Likewise, contractor's pumps are being standardized by the Contractors' Pump Manufacturers' Association. We hope to publish Comparative Information on pumps in the February issue.

BITUMINOUS DISTRIBUTORS

Manufacturer	Model	Tank Capacity Gals.	Type of Pump	Normal Pump Capacity Gals. per Minute	Make of Engine	H.P. of Engine	Number of Heating Burners
Austin Western Road Machinery Co.	..	600	Displacement	350	Waukesha	31	2
	..	800	Displacement	350	Waukesha	31	2
	..	1000	Displacement	350	Waukesha	31	2
	..	1200	Displacement	350	Waukesha	31	2
Kinney Mfg. Co.	A	500-2000	Kinney	405	Hercules	36	2
	B	500-2000	"SD"	405	Hercules	36	2
	C	350-1000	Jacketed	300	Hercules	27	1
	D	350- 600	Jacketed	118	Hercules	13	1
	E	350- 600	Jacketed	118	Hercules	13	1
Littleford Bros.	M	300-1200	Viking	200 or 350	Le Roi	15 & 25	1 or 2
	C	500-2000	Viking	350	Le Roi	25	1
Municipal Supply Company	..	300-2000	Viking	375	Hercules	37½	2
	..	300-2000	Viking	250	Hercules	25½	2
	..	300- 800	Viking	100	Hercules	12	1
E. D. Etnyre & Co.	FX, FC, MX, MC	300-3000	Etnyre	375	Le Roi	36	2*
Standard Steel Works	100	500-1200	Viking	300	Le Roi	36-40	2
	200	400- 800	Viking	250	Le Roi	15-25	1
Chas. Hvass & Co., Inc.	..	....	.....	...	.....	..	..

*2 for flues, 1 portable.

CONCRETE FINISHING MACHINES

Manufacturer	Travel Speed, F.P.M.	Type of Tamper	Transverse or Longitudinal Finishing Stroke	Make of Engine	Engine H.P.	Finishing Widths	Weight
Blaw-Knox Co.	7'-14'-35"66'	Vibrating	Transverse	Hercules	23	9'-30'	7,500-15,000
Flexible Road Joint Machine Company	Multi	Vibrator	Transverse	Hercules or Leroy	16-30	3'-50'	2,000-16,000
Jaeger Machine Co.	8 to 15	Separate	Transverse	Hercules	23	8'-30'	7,500-12,000

CONCRETE CONSTRUCTION MIXERS

These are differentiated from pavers by their name. See the explanation of the sizes and letters used as given under Concrete Pavers.

Manufacturer	Trade Name	Model T—Tilter NT—Nontilter	Batch Capacity Cu. Ft.	Drum, R.P.M.	Make Engine	Engine H.P.	Weight, Lb.
The American Cement Machine Co., Inc.	BOSS 3½S	T	3½	20	Stover	2	1,150
	BOSS 3½S	NT	3½	20	Stover	2½	1,575
	BOSS 5S	NT	5	18	LeRoi	6	3,000
	BOSS 7S	NT	7	18	LeRoi	8	3,800
	BOSS 10S	NT	10	18	LeRoi	12	4,800
	BOSS 14S	NT	14	18	LeRoi	25	10,000
	BOSS 28S	NT	28	16	LeRoi	35	12,500
Chain Belt Co.	Rex 3½S	....	3½	21	Stover	2	1,200
	Rex 5S	....	5	..	Wisconsin	..	....
	Rex 7S	....	7	17	LeRoi	8	3,295
	Rex 10S	....	10	18	LeRoi	12	4,115
	Rex 14S	....	14	16.3	LeRoi	20	7,650
Construction Machinery Co.	Wonder 2½ "Cub"	....	2½	24	Jumbo	1	395
	Wonder "3"	....	3	19	Stover	2	1,080
	Wonder 3½S	....	3½	19	Stover	2½	1,145
	CMC 3½S	....	3½	17.7	Stover	2½	1,280
	Wonder 5S	....	5	17	LeRoi	5	2,780
	CMC 5S	....	5	17	LeRoi	5-6	2,700
	Wonder 7S	....	7	17	LeRoi	7-9	3,200
	Master 7S	....	7	18	LeRoi	7-9	3,830
	Silverstreak 7S	....	7	18	LeRoi	7-9	4,000
	CMC 7S	....	7	18	LeRoi	7-9	3,300
	Wonder 10S	....	10	17	LeRoi	10-12	4,100
	Master 10S	....	10	17	LeRoi	10-12	4,750
	Silverstreak 10S	....	10	17	LeRoi	10-12	4,800
	CMC 10S	....	10	17	LeRoi	10-12	3,800
	Master 14S	....	14	17	LeRoi	20-25	7,600
	Silverstreak 14S	....	14	17	Hercules	20-25	5,000
	Master 28S	....	28	14.5	LeRoi	35	10,000
The Jaeger Machine Co.	Jaeger 3½	T	3½	20	Stover	2½	1,470
	Jaeger 5	T	5	20	Stover	3½	2,900
	Jaeger 7	T	7	18	LeRoi	12	3,960
	Jaeger 10	T	10	18	Hercules	25	5,060
	Jaeger 3½	NT	3½	18	Stover	2	1,470
	Jaeger 7	NT	7	18	Hercules	12	3,840
	Jaeger 10	NT	10	18	Hercules	15-20	4,650
	Jaeger 14	NT	14	16	Hercules	25	7,960
	Jaeger 28	NT	28	14	Hercules	32	12,300
	Jaeger 56	NT	56	12	Electric	40	19,800
The Knickerbocker Co.	Knickerbocker 3½S	....	3½	22	Stover	2-2½	1,250
	Knickerbocker 5SE	....	5	20	International	5	2,250
	Knickerbocker 7S	....	7	20	LeRoi or Novo	7	3,500
	Knickerbocker 7SE	....	7	20	LeRoi	7	3,300
	Knickerbocker 10S	....	10	20	LeRoi or Novo	12	4,500
	Knickerbocker 10SE	....	10	20	LeRoi	12	4,700
	Knickerbocker 14S	....	14	17½	LeRoi or Novo	15	6,100
	Knickerbocker 28S	....	28	15½	Hercules	27-47	12,000
Koehring Company	Koehring 112S	T	112	10	Elec. Motor	60-75	....
	Koehring 84S	NT	84	11	Elec. Motor	60	27,000
	Koehring 56S	T	56	12	Elec. Motor	30	....
	Koehring 56S	NT	56	12	Elec. Motor	40	19,000
	Koehring 28S	NT	28	16.5	Elec. Motor	20	8,900
	Dandie Trail-Mix 14S	NT	14	16	LeRoi	15-20	4,000
	Dandie 14S	NT	14	16	LeRoi	15-20	3,875
	Dandie Trail-Mix 10S	NT	10	18	LeRoi Wis.	10-15	4,000
	Dandie 10S	NT	10	18	LeRoi Wis.	10-15	3,780
	Trail-Mix 7S	NT	7	18	LeRoi Wis.	8-10	2,875
	Dandie 7S	NT	7	18	LeRoi Wis.	8-10	2,925
	Dandie 5S	NT	5	18.5	.....	5-8	2,640
Kwik-Mix Concrete Mixer Co.	Tilting 10S	....	10	16	.....	8	4,450
	Tilting 7S	....	7	16	.....	6	3,700
	Tilting 5S	....	5	17	.....	3½-4	3,130
	Heavy Duty 3½S	....	3½	22	.....	2½	1,900
	Mascot 3½S	....	3½	20	.....	2½	1,040
Leach Co.	Leach 3½S	....	3½	21	Stover	2	1,125
	Leach 7S	....	7	19.2	Stover	8	3,250
	Leach 7S	....	7	19.2	LeRoi	10	3,350
	Leach 10S	....	10	16	LeRoi	12	4,500
	Leach 14S	....	14	15	LeRoi	15	7,250
Ransome Concrete Machinery Co.	Ransome 3½S	....	3½	..	.....	2	1,070
	Ransome 5S	....	5	..	.....	3½	2,700
	Ransome 7S	....	7	..	.....	6-10	3,300
	Ransome 10S	....	10	..	.....	10-12	4,200
	Ransome 14S	....	14	..	.....	20	6,900
	Ransome 28S	....	28	..	.....	35	10,460
	Ransome 56S	....	56	..	.....	..	22,000
	Ransome 84S	....	84	..	.....	..	32,000
	Ransome 126S	....	126	..	.....	..	.....
The T. L. Smith Company	Smith 2½S	Z-27T	2½	15	F & J	1½	880
	Smith 3½S	367T	3½	22	Stover	2-2½	1,200
	Smith 28S	T357T	28	13	LeRoi	40	12,000
	Smith 56S	T	56	11½	Elec.	30	22,000
	Smith 84S	T	84	10½	Elec.	40	27,000
	Smith 112S	T	112	9½	Elec.	50	45,000
	Smith 5S	363NT	5	17½	LeRoi	6	3,200
	Smith 7S	356NT	7	16½	LeRoi	8	3,600
	Smith 10S	356NT	10	16	LeRoi	12	4,400
	Smith 14S	N-30NT	14	16	LeRoi	15	7,000

LARGE WHEEL SCRAPERS

MANUFACTURER	Rated Capacity Cu. Yds.	Approx. Weight Pounds	No. of Wheels or Tires	Wheels and Tires — Front	Wheels and Tires — Rear	Length of Cutting Edge	Depth of Cut. Inches	Ground Clearance Carry. Inches	Method of Dumping	Depth of Spread Controlled Inches	Method of Operation	Pump Make and Model
Austin Western Road Mach. Co.	5	7,200	4 or 6	7.50x18 Single	7.50x18 Dual	6'-0"	6	11	Tilting Bowl Bottom Dump	0 to 9	Single Cable	.....
	12	17,000	6	13.50x20 Single	13.50x20 Dual	9'-6"	1 to 8	..	Front Push Out	0 to 24	Hydraulic	.....
Continental Roll & Steel Fdy. Co.	5	6,875	2	.....x.....	12.00x20 Single	4'-6"	1 to 12	..	Rear Dump	.....	Hydraulic	.....
	7	8,550	2	.....x.....	13.50x20 Single	5'-7"	1 to 12	..	Rear Dump	.....	Hydraulic	.....
	10	13,400	2	.....x.....	18.00x24	6'-6"	1 to 12	..	Rear Dump	.....	Hydraulic	.....
Gar Wood Industries, Inc.	6	9,000	6	12.00x20 Single	9.75x20 Dual	7'-0"	1 to 6	13		0 to 12	Hydraulic	Gar Wood
	8	11,000	6	12.75x20 Single	10.50x20 Dual	8'-6"	1 to 6	13	Tilting Bowl	0 to 12	Hydraulic	Gar Wood
	10	14,000	6	13.50x20 Single	13.50x20 Dual	9'-6"	1 to 6	13	Front Dump	0 to 12	Hydraulic	Gar Wood
	12	17,000	6	13.50x20 Single	13.50x20 Dual	9'-0"	1 to 6	13		0 to 12	Hydraulic	Gar Wood
The Heil Company	6	10,400	6	9.75x20 Single	9.75x20 Dual	6'-6"	1 to 6	15		12	Hydraulic	Hydreco
	8	11,500	6	10.50x20 Single	10.50x20 Dual	7'-0"	1 to 6	15	Front	12	Hydraulic	Hydreco
	10	14,000	6	11.25x20 Single	11.25x20 Dual	7'-6"	1 to 6	15	Push Out	12	Hydraulic	Hydreco
	12	15,500	6	12.00x20 Single	12.00x20 Dual	9'-0"	1 to 6	15		12	Hydraulic	Hydreco
	12	19,500	6	12.00x20 Single	12.00x20 Dual	9'-0"	1 to 6	15		13	Hydraulic	Hydreco
Isaacson Iron Works	4	8,500	6	10.50x20 Single	7.50x20 Dual	8'-6"	1 to 8	14		0 to 14	Hydraulic	Isaacson
	5	9,000	6	12.00x20 Single	9.75x20 Dual	7'-3"	1 to 8	13	Tilting Bowl	.....	Hydraulic	Isaacson
	8	10,500	6	12.75x20 Single	10.50x20 Dual	10'-0"	1 to 8	14	Front Dump	0 to 14	Hydraulic	Isaacson
	8	11,500	6	12.75x20 Single	10.50x20 Dual	8'-8¼"	1 to 8	13		.....	Hydraulic	Isaacson
	12	16,000	6	13.50x20 Single	13.50x20 Dual	9'-6"	1 to 8	13		.....	Hydraulic	Isaacson
Midwest Piping & Supply Co. (Patterson Air or Oil Powered Scoop)	10	17,000	4 or 6	13.50x24 Single	13.50x24 Single or Dual	7'-0"	1 to 12	18	Tilting Bowl Front Dump	0 to 25	Compr. Air or Hydraulic	Ingersoll Rand or Hydreco
R. G. Le Tourneau, Inc.	6	12,200	6	9.75x20 Single	9.75x20 Dual	7'-0"	1 to 8	11	Front	0 to 20	Cable	.....
	8	12,700	6	9.75x20 Single	9.75x20 Dual	8'-6"	1 to 8	11	Push Out	0 to 20	Cable	.....
	12	17,220	6	18.00x24 Single	18.00x24 Single	10'-0"	1 to 8	13		0 to 24	Cable	.....
	6	.....	..	13.50x20 Single	13.50x20 Single	5'-6"	1 to 8	..	Tailgate Forceout	0 to 20	Cable	.....
	9	.....	6	13.50x20 Single	13.50x20 Dual	7'-0"	1 to 8	..	Tailgate Forceout	0 to 20	Cable	.....
	12	.....	4	18.00x24 Single	18.00x24 Single	8'-6"	1 to 8	..	Tailgate Forceout	0 to 24	Cable	.....
	18	24,600	6 or 8	18.00x24 Single	18.00x24 Dual	10'-0"	1 to 8	..	Tailgate Forceout	0 to 24 0 to 37	Cable Cable	....
	4.4	4,800	2	None	36" Dia.x18" Width Steel Wheels	8'-0"	19	18	Gravity			.....

BULLDOZERS

Manufacturer	Approx. Weight Standard Model Lb.	Overall Length Tractor and Bulldozer In.	Moldboard Width Standard Model In.	Moldboard Height In.	Type of Control	Lift Above Ground Line In.	Drop Below Ground Line In.	Type of Control Valve	Pump Make	Pump Capacity G.P.M.	Pump Working Pressure Lb./In.
American Tractor Equip. Co.....	4,550	161	115	33	Hydraulic	33	15	Knapp - Sleeve	Knapp	50	400
	4,750	196	152	33	Hydraulic	33	15	Knapp - Sleeve	Knapp	50	400
Baker Mfg. Co.	2,650	127	74¾	33	Hydraulic	24	10	4 Way - Rotary	Roper	..	250-500
	4,400	146	92	39	Hydraulic	42⅜	12⅞	4 Way - Rotary	Roper	..	250-500
	7,800	185	126	46	Hydraulic	40½	14½	4 Way - Rotary	Roper	..	250-500
Bucyrus Erie Co.....	3,650	156	96	34	Hydraulic	34	12	4 Way - Plug	.....	53	350
Emsco Derrick & Equip. Co.....	4,180	159½	90	38	Cable	32	Unlimited	.....x.....	.....x.....	..x..	...x...
	4,200	146-150	94	32	Hydraulic	30	12	4 Way - Valve	Vickers	38	325
	4,945	198½	122	43	Cable	45	Unlimited	.....x.....	.....x.....	..x..	...x...
	7,200	190	110	40	Hydraulic	30	12	4 Way	.....	..	325
	2,940	142	74	36	Cable	24	Unlimited	.....x.....	.....x.....	..x..	...x...
Euclid Road Mach'y Co.*.....	4,900	183	110	43½	Hydraulic	27	10	4 Way - Cone	Commercial	35	800
	2,600	142	87½	37	Hydraulic	25	12	4 Way - Cone	Euclid	30	800
Gar Wood Industries**.....	7,700	183	114	40	Hydraulic	26	18½	4 Way - Plug	Gar Wood	80	300-600
	3,000	131	79¾	30	Hydraulic	28	14	4 Way - Plug	Gar Wood	51	200-400
	4,150	145	89	30	Hydraulic	36	14	4 Way - Plug	Gar Wood	80	200-500

Hi-Way Service Corp. (Drott).....	3,200	135	85	36	Hydraulic	24	12	4 Way	Commercial	45	175-185
Imperial Mach. Co. (Neiss)	6,000	155½	114	48	Hydraulic	15	10	1 Way - Foot	Northern	6	500
	6,000	155½	114	45	Gear	15	10	.....x.....	.....x.....	..x..	...x...
	2,400	103½	60	31	Hydraulic	13	8	1 Way - Foot	Northern	6	500
	3,000	127	76	40	Hydraulic	15	8	1 Way - Foot	Northern	6	500
	3,200	...	76	35	Gear	15	10	.....x.....	.....x.....	..x..	...x...
Isaacson Iron Works	3,700	142	87	34	Hydr. or Cable	32	14	4 Way - Plug	Isaacson	43	300
	8,000	181	107	42	Hydr. or Cable	32	16	4 Way - Plug	Isaacson	70	300
	2,200	128	72	28	Hydraulic	32	14	4 Way - Plug	Isaacson	33	300
LaPlant-Choate Mfg. Co.*†.....	1,870	118	69	27½	Hydraulic	16¾	6	5 Way - Plug	LaPlant-Choate	25	250
	2,460	155	71	34	Hydraulic	14	6	5 Way - Plug	LaPlant-Choate	25	250
	2,780	135	79¾	32	Hydraulic	24½	9¾	5 Way - Plug	LaPlant-Choate	25	300
	2,880	128	80	32	Hydraulic	24	8	4 Way - Plug	LaPlant-Choate	80	200-450
	4,550	150	92	35½	Hydraulic	32	12	4 Way - Plug	LaPlant-Choate	80	200-450
	5,650	180	116	41¾	Hydraulic	33	12¾	5 Way - Plug	LaPlant-Choate	38	400
	5,030	171	100	41¾	Hydraulic	33	12¾	5 Way - Plug	LaPlant-Choate	38	400
	8,250	185	122	47½	Hydraulic	33	12¾	4 Way - Plug	LaPlant-Choate	90	200-450
R. G. LeTourneau, Inc.	1,880-2,997	151-184	80-98	31-39½	Cable	36 or more	60 to 72	.....x.....	.....x.....	..x..	...x...
	3,972-4,074	184-208	122-134	39½-42	Cable	36 or more	72	.....x.....	.....x.....	..x..	...x...

*†For Caterpillar tractors only.
*Supplies Bulldozers for practically all makes and models of crawler tractors. Necessarily Bulldozers for larger sizes differ in dimensions, weight, etc., from what appears on the smaller ones.
**Make equipment for all sizes and makes of tractors. Weights and dimensions vary with make and model tractor.

BITUMINOUS MIXERS, PAVERS AND SPREADERS

Manufacturer	Trade Name	Plant or Road Mixed	Rated Output	Weight Lb.	Type Spreader	How Propelled	Engine Used	Vibrator	Width Spread or Mixed Ft.	Depth Spread or Mixed In.
J. D. Adams Co.....	Retread Paver	Road	Depends	11,650	Finishing Blade	Drawn	None	No	9-12	3
Barber-Greene Co.	Large Mixer*	Travel Plant	140 T./hr.	21,000	.....	Crawler (self-propelled)	Hercules (HXE)	..	Any	Any
	County Mixer†	Both Travel and Central Plant	100 T./hr.	19,000	.....	.....	Buda L-525	..	Any	Any
	Finisher		100 T./hr.	18,000	Screw	Crawler (self-propelled)	LeRoi D-201	Yes	9-12	0 to 6
Blaw-Knox Co.	Black Top Spreader	Road	Depends	.....	Finishing Blade	Drawn	None	No	9-12	Varies
Flexible Road Joint Machine Co.....	Flex Plane	Either	1 to 3 miles in 8 hours	3,000-9,000	Inverted	Tractor Caterpillar	LeRoi or Hercules	With or Without	9-20	Any
The Foote Co., Inc.....	Adnun	Plant	.....	15,600	.....	Gas	Hercules	Screed	10	Varying
Iowa Manufacturing Co.	Cedar Rapids	Road	140 T./hr.	40,000	.....	Self-propelled	Climax R6I	.....	Any	Any
	Rapid Mix	Plant	140 T./hr.	12,000	.....	Stationary	Any 60-80 HP.	.....	Any	Any
Jaeger Machine Co.	Triple Pug Mill	Road	200 T./hr. macadam grading 100 T./hr. dense grading	14,000	Screed	Tractor	Hercules	No	8-11	3
	Bituminous Paver	Plant	100 T./hr.	15,000	Oscillating Screed	Gas	Hercules	Screed	7-14	0 to 8
The Parsons Co.....	Turbo	Road	1,000 to 2,000 cu. yds.	8,600	Plow	Tractor	.....	No	9	0 to 8
Frank C. Stolle Manufacturing and Sales Co.....	"T. & R" Spreader	Plant	Depends	10,000	Blades	Drawn	None	No	18-28	Varies

*Large Travel Plant includes not only the mixing plant but also a Barber-Greene bucket loader on which are mounted two bituminous tanks for mixer. Weights listed are for mixing plant alone. The loader with tanks weighs approximately 27,000 lb.
†County Model and Travel Mixer includes model 82 bucket loader which weighs appromimately 12,700 lb.

MOTOR

Manufacturer	Approx. Shipping Weight (Single Drive) lb.	ROAD SPEEDS AT RATED ENGINE R.P.M. (in M.P.H.) First	Third	Fourth	Reverse Low	Reverse High	Wheelbase (Single Drive)	Controls Type
J. D. Adams Co.	17870	1.60	4.40	8.20	1.60	4.40	17′ 9″	Mechanical
	16820	1.60	4.40	8.20	1.60	4.40	17′ 9″	Mechanical
	16085	2.50	7.50	12.70	3.90	...	18′ 7″	Mechanical
	14060	2.10	6.20	10.80	2.60	...	17′ 4″	Mechanical
	8300	2.10	6.00	7.50	2.50	...	15′ 2″	Mechanical
Allis-Chalmers Mfg. Co.	14455	2.40	5.20	10.00	2.80	...	18′ 6″	Mechanical
	12340	2.30	5.00	10.00	2.60	...	17′ 4″	Mechanical
Austin Western Road Mach. Co.	.....	1.39	2.81	4.48	1.57	2.51	.....	Hydraulic
	15135	1.39	2.81	4.48	1.57	2.51	18′¾″	Hydraulic
	16135	1.39	2.81	4.48	1.57	2.51	18′¾″	Hydraulic
	15135	1.39	2.81	4.48	1.57	2.51	18′¾″	Hydraulic
	12000	2.35	6.98	11.85	3.03	...	17′ 3″	Hydraulic
Caterpillar Tractor Co.	16520	1.8	5.1	10	3.0	...	18′ 0″	Mechanical
	15000	1.8	5.1	10	3.0	...	18′ 0″	Mechanical
	13410	1.8	5.1	10	3.0	...	17′ 6″	Mechanical
	12800	1.8	5.1	10	3.0	...	17′ 6″	Mechanical
Duplex Mfg. Co.	15160	2.25	6.66	11.33	3.00	...	18′ 3″	Mechanical
	12760	2.74	7.35	10.50	3.16	...	.....	Mechanical
Huber Mfg. Co.	14360	1.60	4.30	7.80	1.60	2.70	17′ 0″	Hydraulic
	12800	1.60	5.30	9.10	1.60	2.70	17′ 0″	Hydraulic
W. A. Riddell Corp.	16170	2.14	6.33	10.76	3.00	...	18′ 6″	Mechanical
	15670	2.60	7.00	10.00	3.00	...	18′ 0″	Mechanical
	14170	2.14	6.33	10.76	3.00	...	18′ 0″	Mechanical
	12900	2.30		10.40				
	13500	2.60	7.00	10.00	3.00	...	17′ 0″	Mechanical
	12000	2.30		10.40				
	12600	2.60	7.00	10.00	3.00	...	15′ 3″	Mechanical
Rome Grader and Machinery Corporation		2.30	9.08	....	....	2.55		
	11600	2.25	7.00	10.00	....	3.00	16′ 8″	Mechanical
	13300	2.25	7.25	12.25	....	3.00	18′ 2″	Mechanical
		2.23	6.47	11.1	....	2.78		
	15000	2.18	7.05	....	....	2.57	18′ 4″	Mechanical
		2.23	6.47	11.1	....	2.78		
	16500	2.18	7.05	....	....	2.57	19′ 2″	Mechanical
Royer Mfg. Co.	15800	2.14	6.33	10.76	3.00	...	18′ 8″	Mechanical
	10000	2.30	7.00	10.40	3.00	...	17′ 5″	Mechanical
	13250	2.30	7.00	10.40	3.00	...	17′10″	Mechanical
		2.60		10.00			18′ 6″	
Rome Grader & Mach. Co.	....	...	...	...	...	...	.....	.....
Spears-Wells Mach. Co., Inc.	12000	2.60	7.00	10.00	3.00	...	18′ 2″	Hydraulic
Wehr Company	14550	2.28	6.63	11.37	3.52	...	17′2 3/16″	Mechanical
	13375	2.30	7.00	10.40	3.00	...	16′ 8″	
	13875	2.40	7.20	12.20	3.10	...	15′ 3″	Mechanical
	11375	2.30		10.40				
	11875	2.60	7.00	10.00	3.00	...	16′ 8″	Mechanical

[1]Also available with Oliver-44 engine giving travel speeds of 2.6, 5.1, 8.4, and reverse 2.6 m.p.m.; OR Twin City-32 engine giving travel speeds of 2.33, 3.14, 6.75, and reverse 1.74 m.p.h.

[2]Also available with Oliver-44 engine giving travel speeds of 2fl.47, 4.85, 8.00 and reverse 2.47 m.p.h.

[3]Also available with Oliver-44 engine giving travel speeds of 2.47, 4.85, 8.00, and reverse 2.47 m.p.h.; OR Twin City-32 engine giving travel speeds of 2.33, 3.14, 6.75, and reverse 1.75 m.p.h.

[4]Also available with Case-CI engine giving travel speeds of 2.69, 3.82, 10.65, and reverse 3.00 m.p.h.; OR Twin City-28 engine giving travel speeds of 2.2, 3.0, and reverse 1.75 m.p.h.

[5]Also available with Case-CI engine giving travel speeds of 2.69, 3.82, 10.65, and reverse 3.00 m. p.h.; OR Oliver-28 engine giving travel speeds of 2.5, 4.0, 7-1, and reverse 3.00 m.p.h.; OR Twin City-28 engine giving travel speeds of 2.2, 3.0, and reverse 1.75 m.p.h. Special second gear giving 4.5 m.p.h. available for Twin City-28.

[6]Also available with Case-CI engine giving travel speeds of 2.54, 3.63, 10.0, and reverse 2.85 m.p.h.

[7]Also available with Case-CI engine giving travel speeds of 2.54, 3.63, 10.0, and reverse 2.85 m.p.h.; OR Twin City-28 engine giving travel speeds of 2.38, 3.8, 6.75, and reverse 2.66 m.p.h.

[8]Also available with Twin City-28 engine giving travel speeds of 2.2, 3.0, and reverse 1.75 m.p.h.; OR Case-CI engine giving travel speeds of 2.54, 3.63, 10.0, and reverse 2.85 m.p.h.; OR Twin City-28 engine giving travel speeds of 2.38, 3.8, 6.75, and reverse 2.66 m.p.h.

CONCRETE PAVERS

The size of a paving mixer is designated by a number, which equals its rated capacity in cubic feet of mixed concrete. The letter "E" is placed after the number. This latter is an outgrowth of the time when pavers were first built and meant that the drum dumped the mixed concrete in a line with the end of the chassis upon which it was mounted. Likewise with construction mixers, the letter "S" meant that the concrete was dumped to the side of the chassis on which the drum or bowl was mounted. All pavers are end dump; "E," construction mixers are either side dump or end dump and designated by "S."

Manufacturer	Trade Name	Model	Batch Capacity Cu. Ft.	Drum, R.P.M.	Make Engine	Engine H.P.	Weight, Lb.
Ransome Concrete Machinery Co.	Ransome 27-E	S	27	....	.....	78	40,000
	Ransome 27-E	Dual drum	27	....	.....	100	58,000
	Ransome 13-E	.....	13	....	.....	30	22,500
The Foote Company	Foote 27-E	.....	27	16	Hercules	90	41,000
Koehring Company	Koehring 27E	2A	27	14.3	Waukesha	72	44,500
	Koehring 13E	.....	13	17.8	Waukesha	38	24,200
T. L. Smith Company	Smith 27E	H36	27	16½	Waukesha	65	38,000
Chain Belt Co.	Rex 27E	.....	27	....	Waukesha	78	41,225

GRADERS

Controls Operated by	BLADE LENGTH ft.	BLADE RANGE Lift Above Ground	BLADE RANGE Side Shift	BLADE PRESSURE Without Scarifier lb.	BLADE PRESSURE With Standard Scarifier lb.	LIFTING MECHANISM Design	ENGINE Make	ENGINE Fuel	ENGINE No. Cylinders	ENGINE N.A.C.C. H.P. Rating	ENGINE Brake Horsepower Maximum
Power	12'0"	14"	38"	9230	10870	Worm and Gear	McD-PD40	Commercial Diesel Fuel	4	36.10	62
Power	12'0"	14"	38"	8800	10440	Worm and Gear	McD-PA40	Gasoline	6	31.54	59
Power	12'0"	13"	21"	7410	8060	Worm and Gear	Case LI	Gasoline	4	34.2	57
Power	12'0"	13"	21"	7475	8655	Worm and Gear	McD-I30	Gasoline	4	28.90	39
Hand	9'0"	12"	16"	4090	4870	Worm and Gear	McD-I12	Gasoline	4	14.4	22.5
Power	12'0"	15"	24"	8925	10275	Screw and Nut	Own	Gasoline	4	40.00	54
Power	12'0"	14"	24"	7240	8590	Screw and Nut	Own	Gasoline	4	32.40	42
Power*	12'0"	14"	24"	....	..	Hydraulic	Buda K-369	Gasoline	6	39.60	53
Power*	12'0"	14"	24"	8200	9820	Hydraulic	Waukesha Hesselman VBKH	Commercial Diesel Fuel	4	32.40	48
Power*	12'0"	14"	24"	8590	9850	Hydraulic	McD-PD40	Commercial Diesel Fuel	4	36.10	55
Power*	12'0"	14"	24"	8200	9820	Hydraulic	Buda K-325	Gasoline	6	34.80	49
Power*	12'0"	14"	24"	6125	7450	Hydraulic	McD-I30[4]	Gasoline	4	28.90	39
Power	12'0"	13"	24"	8153	9900	Screw and Nut	Own	Commercial Diesel Fuel	3	39.67	60
Power	12'0"	13"	24"	8153	9900	Screw and Nut	Own	Gasoline	4	48.4	60
Power	12'0"	15"	24"	6889	8580	Screw and Nut	Own	Diesel Fuel	4	28.90	44
Power	12'0"	15"	24"	6889	8580	Screw and Nut	Own	Gasoline	4	28.9	44
Power	10' or 12'	14"	24"	....	..	Screw and Nut	Case LI[1]	Gasoline		34.20	53
Power	10' or 12'	...	...	6675	7675	.....	McD-I30[5]	Gasoline	4	28.90	39
Power*	12'0"	21"	32"	7810	9290	Hydraulic	Buda	Gasoline	6	39.60	53
Power*	12'0"	21"	32"	7340	8750	Hydraulic	Buda	Gasoline	6	33.75	45.5
Power	12'0"	14"	28½"	8300	10100	Screw and Nut	Case LI[2]	Gasoline	4	34.20	53
Power	12'0"	14"	28½"	8300	10100	Screw and Nut	McD-I30	Gasoline	4	28.90	39
Power	12'0"	14"	28½"	7560	9072	Screw and Nut	McD-I30	Gasoline	4	28.90	39
Power	12'0"	12"	24"/19"	....	..	Screw and Nut	McD-M20 McD-I 30[7] McD-M20	Gasoline	4	28.90	30 39 30
Power	12'0"	12"	19"	....	..	Screw and Nut	McD-M20[8]	Gasoline	4	28.90	39
Power or Hand	10 or 12	15"	24"	6475	6875	Screw and Nut†	Case C. I. or International M-20	Gasoline or Fuel Oil	4	.....	29.8 30.0
Power or Hand	12	15"	24"	7000	8050	Screw and Nut	International I-30	Gasoline	4	28.9	39
Power or Hand	12	15"	24"	8050	8975	Screw and Nut	Case LI or Hart Parr 44	Gasoline or Fuel Oil	4	34.2	53
Power or Hand	14	15"	26"	8775	9875	Screw and Nut	Case LI or Hart Parr 44	Gasoline or Fuel Oil	4	34.2	52
Power	12'0"	8" to 16"	22"	9980	10260	Worm and Gear	Case LI[3]	Gasoline	4	34.20	53
Power	12'0"	8" to 16"	22"	7560	7800	Worm and Gear	McD-I 30[7]	Gasoline	4	28.90	30
Power	12'0"	8" to 16"	22"	8830	10000	Worm and Gear	McD-M20 McD-I 30[7]	Gasoline	4	28.90	30 39
.....	....	...	...	....	....	.....	.....	.....	..	....	..
Power	12'0"	12"	20"	7150	8550	Hydraulic	McD-I30[8]	Gasoline	4	28.90	39
Power	12'0"	13½"	22"	8180	8780	Screw Nut and Trunnion	Case LI[3] McD-M20	Gasoline	4	34.20	53 30
Power	12'0"	14"/13½"	22"	7450	8000	Screw and Nut	McD-I 30[7]	Gasoline			39
Power	12'0"	14"	22"	7350	7950	Screw and Nut	McD-M20 McD-I 30[7]	Gasoline	4	28.90 28.90	39 39

Oliver-44	Gasoline	4	4¾"	6¼"	443.0 cu. ins.	1125
Twin City-32..	Gasoline	4	4½"	6"	381.7 cu. ins.	1075
Case-CI	Gasoline	4	3⅞"	5½"	260.0 cu. ins.	1100
Oliver-28	Gasoline	4	4¼"	5¼"	280.6 cu. ins.	1190
Twin City.-28.	Gasoline	4	4¼"	6"	340.4 cu. ins.	1075

*Power controlled steering.
†Rome Motor Grader hand control design is Worm and Gear.

MOWERS

Manufacturer	Model	Mounting	Make of Prime Mover	Speed M.P.H.	Length Sickle Blade Ft.
J. I. Case Co.....		Tractor Pull type, solid or pneumatic	Case CI	1¼-4	5 5
Centaur Tractor Corp.....	M KV	Pull type Tractor	Centaur Centaur	1 -12 1 -25	5-6 5-6-7
John Deere Co.....		Tractor-drawn Power driven	Any tractor	4¼	4½-5-6-7
Fate-Root-Heath Co.		Tractor power take-off	Silver King tractor	1 -25	5-6
International Harvester Co.....	No. 12 No. 112-A No. 112-A No. 112-A No. 112-A No. 10-A No. 10-A No. 30	Tractor power take-off Tractor power take-off Tractor power take-off Tractor power take-off Tractor power take-off Tractor power take-off Tractor power take-off Tractor power take-off	F-12 tractor I-12 tractor Fairway-12 tractor O-12 tractor W-12 tractor F-20 tractor F-30 tractor W-30 tractor	2¼-3¾ 2¼-7¼ 2¼-7¼ 3½ 2¾ 2¼-3¾ 2 -3¾ 2 -4	5-6-7 5-6-7 5-6-7 5-6-7 5-6-7 5-6-7 5-6-7 5-6-7
Rome Grader and Mchy. Corp.....		Tractor	Rome	x x	6-7
Topeka Highway Mower Co.....		Ford V-8 chassis	Ford V-8	1 -6-8	5-6-7
Toro Mfg. Co.....		Any truck Tractor	..... Ford	1 -10 1 -5	5 5

PORTABLE COMPRESSORS

Manufacturer	Output in Cu. Ft. Per Min. at 100 Lb. Pressure	Weight[1] Lb.	Make of Engine	No Air Cylinders
Chicago Pneumatic Tool Co.	60	2,300	Hercules	2
	105	3,400	Hercules	2
	160	5,525	Hercules	2
	210	5,700	Hercules	4
	315	8,050	Hercules	4
Davey Compressor Co.	105*	3,900	Hercules	2
	105*	6,500	Caterpillar***	2
	160*	5,500	Hercules	3
	160*	4,800	Domark**	3
	160*	7,900	Caterpillar***	3
	210*	6,400	Hercules	4
	210*	5,500	Domark**	4
	210*	10,400	Caterpillar***	4
	315*	8,200	Hercules	4
	315*	13,900	Caterpillar***	4
	105*	1,250	Truck power take-off	2
	160*	1,750	Truck power take-off	3
	105*	1,400	Tractor mounting	2
	160*	1,800	Tractor mounting	3
	210*	2,400	Tractor mounting	4
	315*	3,300	Tractor mounting	4
*Single or two-stage, air-cooled **Air-cooled engine. ***Diesel engine.				
Gardner-Denver Co.	85	4,650	Buda	3
	105	5,000	Buda	3
	160	7,500	Buda or Caterpillar	3
	210	9,950	Buda or Caterpillar	6
	315	13,750	Buda or Caterpillar	6
	420	17,500	Caterpillar	4
Hercules Steel Product†	55	1,500	Truck mounted	1-4
	105	1,700	Truck mounted	1-4
	160	2,100	Truck mounted	1-4
	210	2,700	Truck mounted	1-4
†Truck motor operated units only. Any make compressor available.				
Ingersoll-Rand Co.	1.2 to 6156	....	.....	1-8
The Buhl Company	120	3,200	Wis	2
	240	5,600	Wis	4
	360	6,500	Wis	6
Le Roi Co.	12***	595	Le Roi	1
	24***	885	Le Roi	2
	60***	1,495	Le Roi	2
	105*	3,575	Le Roi	2
	105**	3,820	Le Roi	3
	160*	5,175	Le Roi	2
	160**	3,820	Le Roi	3
	210*	5,195	Le Roi	2
	210**	4,790	Le Roi	3
	260*	6,350	Le Roi	2
	260**	6,220	Le Roi	6
	315**	6,890	Le Roi	6
	370**	6,960	Le Roi	6
	420**	7,320	Le Roi	6
*Single Stage Super-Charged. **Two Stage. ***Single Stage.				
O. K. Clutch & Machinery Co.	85*	3,000	Hercules	2
	110*	3,100	Hercules	2
	160*	5,000	Hercules	4
	210*	5,200	Hercules	4
	160**	5,200	Hercules	4
	210**	5,400	Hercules	4
	85*	3,300	Hercules Diesel	4
	160*	5,600	Hercules Diesel	4
	210*	6,000	Hercules Diesel	4
	160**	5,800	Hercules Diesel	4
	210**	6,200	Hercules Diesel	4
*Single stage. **Two stage.				
Schramm, Inc. (Utility Jr.).	18	860	Hercules Gas	2
" "	25	1,310	Buda Gas	3
" "	33	1,320	Buda Gas	3
("Utility" Type)	85	2,300	Buda Gas	4
" "	105	2,475	Buda Gas	4
" "	160	3,800	Buda Gas	6
" "	210	3,950	Buda Gas	6
" "	260	4,200	Buda Gas	6
" "	315	5,630	Buda Gas	6
("Fordair")	55	1,200	Ford V-8	4
"	105	1,740	Ford V-8	8
("Utility" Type)	105	2,770	Buda Lanova Diesel	4
" "	160	4,000	Buda Lanova Diesel	4
" "	210	4,200	Buda Lanova Diesel	6
" "	260	5,300	Buda Lanova Diesel	6
" "	315	6,490	Buda Lanova Diesel	6
" "	420	7,515	Buda Lanova Diesel	6
Gordon Smith & Co.	60	1,100	Ford	2

PORTABLE COMPRESSORS—*Continued*

Sullivan Machinery Co.	105	3,500	*Buda	2
	160	5,000	*Buda	2
	210	7,500	*Buda	4
	315	9,600	*Buda	4
	105	4,800	**Caterpillar	2
	160	7,000	**Caterpillar	2
	210	9,500	**Caterpillar	4
	315	10,000	**Caterpillar	4
Wenzel-Kenney Machinery Co.	52	x	Ford V-8	4
	104	x	Ford V-8	8
Worthington Pump & Mchy. Corp.	60	3,500	Hercules	2
	105	4,300	Hercules	3
	160	4,500	Hercules	3
	210	7,000	Hercules	6
	315	7,500	Hercules	6

*Buda Gasoline.
**Caterpillar Diesel.

[1]Weight may or may not include mountings or accessories depen ding upon type of compressor.

ROAD ROLLERS

Manufacturer	Type	Wheel Base Ft.	Wheel Base In.	Rolling Width In.	Width of Rollers Front/Rear Inches	No. Speeds	Speed M.P.H.	Make Engine	Engine H.P.	Total Weight Ton
Austin Western Road Mchy. Co.	Cadet 6	9	6	66	37 18	3	1 to 5	Buda	41	6
	Cadet 7	9	6	66	37 18	3	1 to 5	Buda	41	7
	Cadet 8	9	6	66	37 18	3	1 to 5	Buda	41	8
	Autocrat 10	10	11	76	45 20	3	1 to 5	Buda	56	10
	Autocrat 12	10	11	76	45 20	3	1 to 5	Buda	56	12
Acme Road Mchy. Co.	N	11	0	84	48 20	2	1½-3	Any	60	12
	6F	10	10	68	42 18	2	1½-3	Any	50	10
	6F	10	10	68	42 18	3	1½-4½	Any	50	10
	KF	10	0	68	38 16	2	2-3	Any	40	8
	KF	10	0	65	38 16	3	1-4	Any	40	8
	CF	10	0	65	37 16	2	2-3	Any	35	5
	CF	10	0	65	37 16	3	1-4	Any	35	5
	5-ton tandem	10	10	40	36 40	2	2-3½	Hercules	35	5
	8-ton tandem	11	6	48	48 48	2	2-3½	Hercules	40	8
The Buffalo-Springfield Roller Co.	2-ton tandem	5	7¼	40	32 40	1	3	Hercules	24	2
	3-ton tandem	7	0	40	32 40	1	2.32	Waukesha	28	3
	5-6 ton tandem	9	5⅝	44	44 44	2	2 to 3	Waukesha	35	5-6
	7-10 ton tandem	10	5¾	50	50 50	2	2 to 3	Waukesha	45	7-10
	10-14½ ton tandem	11	3¾	54	54 54	2	2 to 3	Waukesha	50	10-14½
	5-ton 3-wheel	8	7¾	64	36 16	2	1½ to 3	Waukesha	37	5
	8-ton 3-wheel	10	3¼	68	40 18	3	1¼ to 3¾	Waukesha	40	8
	10-ton 3-wheel	11	5	76	44 20	3	1⅓ to 4	Waukesha	58	10
	14-ton 3-wheel	11	9	81	47 20	3	1 to 3	Waukesha	57	14
	16-ton 3-wheel	12	1	88⅝	51 22	3	1 to 3	Waukesha	70	16
	Inter-Roll	11	5	76	45 24	3	1⅓ to 4	Waukesha	58	13
	3-axle tandem	18	6	54	54 54	2	2 to 3	Waukesha	50	13
C. H. & E. Mfg. Co.	2-ton tandem	4	10	45	24 34	2	0-6	LeRoi or Wisconsin	14	1½-2
Davenport-Besler Co.	.....	11	8	78	42 21	3	1 to 5	McCormick-Deering	48	10
	.....	9	4	42	42 21	3	2¼ to 3¾	"	35	5¼
	.....	9	4	42	42 21	3	2¼ to 3¾	"	35	4¼
	.....	9	4	42	42 21	3	2¼ to 3¾	"	35	3¾
Erie Machine Shops, Inc.	5-ton tandem	9	10	39	39 39	Varies	1-2-3-4	Waukesha	40	5¼
	8-ton tandem	10	11	48	48 48	Varies	1-2-3-4	Waukesha	50	8¼
	10-ton tandem	11	2	48	48 48	Varies	1-2-3-4	Waukesha	55	9¾
	12-ton tandem	11	2	48	48 48	Varies	1-2-3-4	Waukesha	60	10½
Huber Mfg. Co.	5-ton	8	1	67½	37 18	4	1½	Buda	38	5
	6-ton	8	1	67½	37 18	4	3	Buda	38	6
	7-ton	9	4	67½	37 18	4	4½	Buda	45	7
	8-ton	9	4	67½	37 18	4	9	Buda	45	8
	10-ton	11	8	75	43 20	3	1½ to 5	Buda	56	10
	12-ton	11	8	75	43 20	3	1½ to 5	Buda	60	10
Hercules Co.	3-wheel gas	9	1	68	37 18	3	1-3-5	Hercules	40	6
	3-wheel gas	9	1½	68	37 18	3	1-3-5	Hercules	40	7
	3-wheel gas	10	2	70	39 18	3	1-3-5	Hercules	45	8
	3-wheel gas	11	2	74	42 20-24	3	1-3-5	Hercules	58	10
	3-wheel gas	11	9	79	44 20-24	3	1-3-5	Hercules	68	12
	3-wheel gas	11	9	79	44 20-24	3	1-3-5	Hercules	78	15
	3-wheel diesel	9	1	68	37 18	3	1-3-5	Hercules	40	6
	3-wheel diesel	9	1½	68	37 18	3	1-3-5	Hercules	40	7
	3-wheel diesel	10	2	70	39 18	3	1-3-5	Hercules	45	8
	3-wheel diesel	11	2	74	42 20-24	3	1-3-5	Cummins	58	10
	3-wheel diesel	11	9	79	44 20-24	3	1-3-5	Cummins	68	12
	3-wheel diesel	11	9	79	44 20-24	3	1-3-5	Cummins	78	15
The Parsons Co.	Tractor pulled	..	..	72	(*)	..	....	.....	..	10
Pierce Governor Co.	Baby Bear tandem	3	8	28	20 24	2	1 to 5	Briggs Stratton	4½	¾
	Middle Size Bear tandem	5	0	40	24 34	2	1 to 6	Le Roi	14½	1½-2
	Big Bear tandem	6	0	46	24 34	2	1 to 6	Continental	20	3
Wheeled Roller Corp.	B pulled	..	..	36	(*)	..	....	.....	..	2
	B pulled	..	..	60	(*)	..	....	.....	..	3
	Motorized	..	..	24	(*)	1	1 to 2½	Vaughn	5	1½

*One Roll.

TRACK TYPE

MANUFACTURER	MODEL	FUEL	Shipping Wt. (Approx.) Standard Model, Lb. (e)	Drawbar H.P.	Engine	
					Make of	N. A. C. C. Horsepower Rating (a)
Allis-Chalmers Mfg. Co.		Commercial				
	LO	Diesel Fuel	23,000	79.14	Own	66.15
	L	Gasoline	21,550	79.14	Own	66.15
		Commercial				
	KO	Diesel Fuel	11,012	49.58	Own	44.00
	K	Gasoline (c)	10,688	49.58	Own	40.00
	M	Gasoline	6,500	30.98	Own	32.40
	M	Trac. Fuels	6,500	30.38	Own	32.40
Bates Mfg. Co.	80	Gasoline	22,500	65.00	Waukesha	67.80
	50	Gasoline	14,000	55.14	Waukesha	51.50
		Commercial			Waukesha	32.40
	40	Diesel Fuel	11,000	40	Hesselman	32.40
	35	Gasoline	10,750	44.56	Waukesha	43.50
Caterpillar Tractor Co.		Commercial				
	RD-8	Diesel Fuel	32,790	96.74	Own	79.35
	70	Gasoline (c)	31,070	77.07	Own	78.40
		Commercial				
	RD-7	Diesel Fuel	21,130 or 20,410	62.44	Own	52.90
	50	Gasoline (c)	18,890 or 18,080	52.65	Own	48.40
		Commercial				
	RD-6	Diesel Fuel	15,560 or 14,820	45.38	Own	39.67
	R-5	Gasoline (c)	13,970 or 13,370	53.37	Own	48.40
		Commercial				
	RD-4	Diesel Fuel	9,740 or 9,470	35	Own	28.90
	30	Gasoline	9,280 or 9,010	35	Own	28.90
	30	Trac. Fuels	9,280 or 9,010	32	Own	28.90
		Gasoline	6,240 or 6,200	25.77		
	22	Trac. Fuels		24.95	Own	25.60
Cleveland Tractor Co.		Commercial				
	FD	Diesel Fuel	25,800	93	Hercules	60.00
	FG	Gasoline (c)	24,500	94	Hercules	79.20
		Commercial				
	DD	Diesel Fuel	12,700	61.18	Hercules	45.90
	DG	Gasoline (c)	12,000	60.50	Hercules	51.34
	CG	Gasoline (c)	11,500	44.6	Hercules	43.30
		Commercial				
	BD	Diesel Fuel	8,800	35	Hercules	29.40
	BG	Gasoline	8,350	35	Hercules	33.75
	BG	Tractor Fuels	8,350	28.90	Hercules	33.75
		Gasoline	6,800	27		
	AG	Tractor Fuels		22.30	Hercules	25.60
		Gasoline	5,000 5,050	22.11		
	E	Tractor Fuels	5,100	20.90	Hercules	25.60
International Harvester Co.		Commercial				
	TD-40	Diesel Fuel	12,400	44.68	Own	36.10
	TA-40	Gasoline	12,000	45.58	Own	31.54
	T-20	Kerosene	6,725	24.35	Own	22.50

(a) Used for tax purposes. (b) Measured from face of standard track shoe. (c) Low grade fuels may also be used. (d) With

SCARIFIERS

Manufacturer	Weight, lb. (Standard) (*)	Length (*)	Swath Width (*)	Number Teeth	Clearance above Ground	Pressure, lb. (Standard)	Lifting Mechanism
J. D. Adams Co.	1180**	....	3'10"	11	11"	7890	Worm and Gear
	1180**	....	3'10"	11	11"	7580	Worm and Gear
	1110	4'2" 6'4"	11 teeth 3'10" 17 teeth 6'0"	11 and 17	10"	6380	Worm and Gear
	1110	4'2"	11 teeth 3'10" 17 teeth 6' 0"	11 and 17	10"	5900	Worm and Gear
	500	....	3'1"	9	....	3400	Worm and Gear
Allis-Chalmers Mfg. Co.	1096	4'0"	3'10"	11	9½"	6410	Worm and Gear
	1234	6'2"	6' 0"	19			
	1096	4'0"	3'10"	11	9½"	4700	Worm and Gear
	1234	6'2"	6' 0"	19			
Austin Western Road Mach. Co.	1150, 1200, 1200	3'8", 4'2½" 3'11"	3'5", 4'0" 3'8"	9 and 13 straight 13 staggered	9" to 12"	6500	Hydraulic
	1150, 1200, 1200	3'8", 4'2½" 3'11"	3'5", 4'0" 3'8"	9 and 13 straight 13 staggered	9" to 12"	6850	Hydraulic
	1150, 1200, 1200	3'8", 4'2½" 3'11"	3'5", 4'0" 3'8"	9 and 13 straight 13 staggered	9" to 12"	6970	Hydraulic
	1150, 1200, 1200	3'8", 4'2½" 3'11"	3'5", 4'0" 3'8"	9 and 13 straight 13 staggered	9" to 12"	5540	Hydraulic
Caterpillar Tractor Co.	1150**	4'0"**	3'10"**	11**	9" to 12"	6541	Worm and Gear
	1291	6'2"	6' 0"	17			
	1150**	4'0"**	3'10"**	11**	9" to 12"	5833	Worm and Gear
	1291	6'2"	6' 0"	17			
Duplex Mfg. Co.	....	....	2'10"	9	....	....	.....
	....	....	2'10"	9	....	....	.....
Gar Wood Industries, Inc.††	1470	....	4'2"	5	16"	....	Mechanical
	5395	....	5'0"	5	16"	....	Mechanical
	6700	....	5'7"	5	16"	....	Mechanical
Huber Mfg. Co.	1000	4'6½"	4'0"	9	22½"	7988	Hydraulic
	1000	4'6½"	4'0"	9	22½"	8470	Hydraulic

TRACTORS

Turning Radius Std. (e)	TRACKS: Area of Ground Contact sq. in.	TRACKS: Ground Pressure lbs. per sq. in. (d)	Ground Clearance in ins. (b)	MAXIMUM DRAWBAR PULL—SPEED—AT RATED ENGINE SPEED: First: Drawbar Pull, lb.	First: Speed, m.p.h.	Third: Drawbar Pull, lb.	Third: Speed, m.p.h.	Reverse Low: Drawbar Pull, lb.	Reverse Low: Speed, m.p.h.	Power Takeoff R.P.M. at Rated Engine Speed
9′-0″	3,418	6.74	14⅜	20,600	1.48	11,300	2.68	17,700	1.72	288-221
9′-0″	2,734	7.88	14⅜	20,600	1.48	11,300	2.68	17,700	1.72	288-221
7′-0″	2,010	5.47	11	11,100	1.72	5,300	3.26	9,000	2.10	595
7′-0″	2,010	5.31	11	11,100	1.72	5,300	3.26	9,000	2.10	595
6′-0″	1,353	4.80	8⅞	5,400	2.23	2,426	4.15	4,700	2.55	542
6′-0″	1,353	4.80	8⅞	5,506	2.23	2,568	4.15	4,700	2.55	542
9′-0″	3,744	6.01	17	17,500	1.50	7,550	3.50	19,780	1.30	.....
7′-0″	2,296	6.09	14	10,446	1.80	4,662	3.80	10,446	1.80	.....
6′-0″	1,950	5.63	12	.....	....	.....	....	.....	....	.....
6′-0″	1,680	6.40	12	8,534	1.80	3,621	3.80	8,534	1.80	.....
9′-5″	3,905	8.39	10½	21,599	1.7	13,071	2.8	21,599	1.7	372
9′-5″	3,905	7.96	10½	17,799	1.70	10,184	2.70	17,799	1.70	306
8′-8″ or 7′-8″	2,948	6.93	11¼	15,264	1.6	6,426	3.4	12,300	1.9	283 or 340
8′-8″ or 7′-8″	2,948	6.14	11¼	12,878	1.6	5,344	3.4	10,640	1.90	283 or 340
8′-4″ or 7′-1″	2,392	6.19	10⅛	10,274	1.7	4,987	3.2	9,125	1.9	535
8′-4″ or 7′-1″	2,392	5.58	10⅛	11,100	1.9	5,478	3.6	9,850	2.1	598
6′-9″ or 6′-0″	1,589	5.9	11⅛	7,725	1.7	4,170	3.0	6,800	1.9	545
6′-10″ or 6′-7″	1,589	5.6	11⅛	7,725	1.7	4,170	3.0	6,800	1.9	545
6′-10″ or 6′-7″	1,589	5.6	11⅛	7,040	1.7	3,800	3.0	6,200	1.9	545
5′-10″ or 5′-4″	1,090	5.69	9	4,998 4,829	2.0	2,492 2,367	3.6	4,815 4,650	2.1	536
9′-0″	3,840	6.72	12¾	20,400	1.75	7,140	4.25	.....	2.10	930 or 320
9′-0″	3,840	6.38	12¾	20,570	1.75	7,100	4.30	.....	2.10	800 or 308
7′-4″	2,240	5.67	13½	11,770	1.80	5,238	4.30	.....	1.8	885 or 510
7′-4″	2,240	5.36	13½	11,340	1.80	5,050	4.30	.....	2.20	885 or 510
7′-4″	2,093	5.48	13½	9,600	1.87	3,250	4.44	.....	2.28	1,015 or 545
7′-0″	1,764	4.98	13½	7,770	1.80	3,580	3.50	.....	1.38	1,145 or 600
7′-0″	1,764	4.73	13½	7,400	1.80	3,580	3.50	.....	1.38	1,145 or 600
7′-0″	1,764	4.73	13½	6,290 5,700	1.80	2,125 2,500	3.50	.....	1.38	1,145 or 600
6′-6″	1,488	4.57	11¾	5,700	1.75	1,913	3.75	.....	1.38	1,020 or 680
.....	904	....	12¼ 16¼	4,150 3,502	2.12	2,016 1.913	4.00	.....	1.62	865 or 595
7′-0″	2,240 2,520	5.54	11¾	9,818	1.70	6,187	2.70	.....	2.20	535
7′-0″	2,240 2,520	5.36	11¾	9,980	1.70	5,980	2.70	.....	2.20	546.3
6′-0″	1,050 1,680	6.40	7¾	5,860	1.60	2,107	3.80	.....	2.00	543.5

standard trackshoes. (e) When more than one figure is shown for one size the larger figure is for the wide gauge.

SCARIFIERS—*Continued*

Manufacturer	Weight, lb. (Standard) (*)	Length (*)	Swath Width (*)	Number Teeth	Clearance above Ground	Pressure, lb. (Standard)	Lifting Mechanism
Killefer Co.*†	4050	....	6′8″	5	...	....	Mechanical
	5320	....	6′8″	5	...	....	Mechanical
	7260	....	7′6″	5	...	....	Mechanical
	2200	....	5′0″	5	...	....	Mechanical
	3150	....	5′0″	5	...	....	Mechanical
	4200	....	5′0″	5	...	....	Mechanical
	6190	....	6′0½″	5	...	....	Mechanical
W. A. Riddell Co.	1150	....	3′5½″	11	8″	....	Worm and Gear
	1300		4′10″	15			
	1150	....	3′5½″	11	8″	....	Worm and Gear
	1300		4′10″	15			
	1150	....	3′5½″	11	8″	....	Worm and Gear
	1000	3′0″	2′9½″	9	8″	....	Mechanical
	....	3′0″	2′9½″	9	....	....	Mechanical
Rome Grader and Mach. Corp.	910	....	3′7″	7	....	....	Worm and Gear
Royer Mfg. Co.	1250	3′2″	3′0″	9	9″ to 12″	7300	Mechanical
	1250	3′2″	3′0″	9	9″ to 12″	6700	Mechanical
	750	3′2″	3′0″	9	9″ to 12″	5400	Mechanical
Spears-Wells Machine Co.	1000	4′0″	3′8″	17	12″	....	Hydraulic
R. G. LeTourneau, Inc.	8200	17′0″	7′7″	3 or 5	14½″	....	Cable
	4685	13′6″	5′6″	3 or 5	11″	....	Cable
Wehr Company	1000	3′9″	3′5½″	11 to 17 in line or staggered	....	....	Mechanical
Willett Mfg. Co.	....	4′0″	4′0″	13	4″	....	Hydraulic

*Where two figures appear for the same grader the larger figure is for the extra long scarifier.
**V-type.
*†Depth penetration varies from 12 to 15 inches controlled.
††Depth of penetration up to 12 inches controlled.

TRAIL

Manufacturer	Approx. Wt. Std. Model, Pounds	Overall Length Tractor and Trailbuilder, Inches	Moldboard Width Std. Model, Inches	Moldboard Height, Inches	Angle of Moldboard With Tractor Centerline
American Tractor Equipt. Co.	5,800	240	152	33	65°
Baker Mfg. Co.	5,250	160⅞	116	27⅝	65°
	9,400	193 7/16	158½	34⅝	65°
	2,670	149	94½	24	65°
Blaw-Knox Co.	5,800	240	152	33	65°
Bucyrus Erie Co.	4,260	173	108	24	65°
Emsco Derrick & Equipt. Co.	3,400	150	100	32	60°
	4,450	162-168	96	23	65°
	4,400	154-158	96	23	65°
	7,950	195	132	30	65°
	7,800	200	132	30	65°
	6,610	211½	152	42	60°
	4,710	169½	115	36	60°
Gar Wood Industries	3,500	148	86⅞	25	65°
	9,000	204	125¼	35½	65°
	4,500	164	104¼	25	65°
Isaacson Iron Works	2,450	140-144	80	26	65°
	8,400	198	125	42	65°
	4,000	160-165	95	32	65°
Imperial Machine Co. (Neiss)	7,500	.....	180	35	60°
	4,000	.....	120	28	60°
LaPlant-Choate Mfg. Co.*	2,270	128¾	89¾	24	65°
	3,500	143½	99½	26¾	65°
	3,270	150¼	92¼	26¾	65°
	5,150	162	116½	30¼	65°
	7,075	202½	145½	34½	65°
	5,790	192	124	34½	65°
	9,850	230	153¼	40½	65°
Pacific Car & Fdy. Co.	4,500	.....	106	26	60°
	8,000	.....	138	37	...
R. G. LeTourneau, Inc.	5,192 to 5,919	191-235	151	39½	60°
	3,642	172	111	31	60°
	4,457 to 4,973	189-193	127-151	31-39½	60°

*For Caterpillar tractors only.

SIZES AND TYPES OF POWER SHOVELS, CRANES AND DRAGLINES

Practically all manufacturers furnish optional power, i. e., gasoline, oil, diesel or electric. Most shovels are convertible to cranes or draglines. The size of clamshell or dragline bucket they will handle depends on the nature of the materials to be handled and the operating radii required in different cases.

Manufacturer	Sizes: ⅜	½	⅝	¾	1	1¼	1½	1¾	2	2½ and Larger
American Hoist and Derrick Co.	..	√	..	..	√	√	√	√	√	.....
Austin Western Road Machinery Co.	..	√	..	..	..	...	...	...	...	.....
Byers Machine Co.	√	√	√	√	√	√	...	...	...	.....
Browning Crane & Shovel Co.	√	√	√	√	√	√	√	...	...	.....
Bay City Shovels	√	√	√	√	√	√	...	...	...	.....
Buckeye Traction Ditcher Co.	..	√	√	√	..	...	...	...	...	.....
Bucyrus Erie Company	√	√	√	√	√	√	√	√	√	and larger
Bucyrus-Monighan Co.*†	..	..	..	..	√	...	...	...	√	... and larger
General Excavator Co.	..	√	√	√	..	...	...	...	...	... .
Frank G. Hough Co.	..	√*	..	..	..	...	...	...	...	... .
Harnischfeger Corporation	√	√	..	√	√	√	√	√	√	√ and larger
Hanson Clutch & Machine Co.	√	√	√	√	..	...	...	...	...	... .
Industrial Brownhoist	..	√	..	√	√	...	...	...	...	... .
Insley Manufacturing Corp.	√	..	..	..	..	...	...	...	...	... .
Keystone Driller Co.	..	..	..	..	√	√	...	...	...	... .
Koehring Company	..	..	√	√	√	√	√	√	√	√ .....
Lima Locomotive Works	..	..	..	√	√	√	√	√	√	√ .....
Link Belt Company	..	..	..	..	√	√	√	√	√	√ and larger
Marion Steam Shovel Co.	..	..	..	√	√	√	√	√	√	√ .....
Manitowoc Engineering Co.	..	..	..	√	√	√	√	√	√	√ .....
Michigan Power Shovel Co.**	√	..	..	..	..	...	...	...	...	... .
Northwest Engineering Co.	√	√	√	√	√	√	√	√	√	√ and larger
Ohio Locomotive Crane Co.	√	..	..	..	..	...	...	...	...	... .
Osgood Company**††	..	..	..	..	..	...	...	...	...	... .
The Parsons Co.	¼†	..	..	..	..	...	...	...	...	... .
Page Engineering Co.*†	..	..	..	..	..	...	...	...	...	... and larger
Quick Way Truck Shovel Co.**	..	√	..	..	..	...	...	...	...	... .
Speeder Machinery Co.††	√	√	..	√	..	...	...	...	...	... .
Star Drilling Machine Co.	..	..	..	√	..	...	...	...	...	... .
Thew Shovel Co.-Universal Crane Co.	√	√	√	√	√	√	√	...	√	... .
Universal Power Shovel Corp.	√	√	√	..	..	...	...	...	...	... .

*Tractor. †Dragline backfiller. *†Walking dragline. **Truck shovels only. ††Also, truck mounted ½-yd. and ⅝-yd. and tractor mounted ¾-yd. **††Sizes built range from ⅜ cu. yd. to 2 cu. yds.

BUILDERS

Moldboard Tilt, Inches	Type of Control	Lift Above Ground Line, Inches	Drop Below Ground Line, Inches	Type of Control Valve	Pump Make	Pump Capacity, G.P.M.	Pump Working Pressure, lb./in.²
8	Hydraulic	33	15	Knapp-Sleeve	Knapp	50	400
12	Hydraulic	33	14	Rotary-4-Way	Roper	..	250-500
12	Hydraulic	40½	14½	4 Way-Rotary	Roper	..	250-500
12	Hydraulic	23	11	4 Way-Rotary	Roper	..	250-500
8	Hydraulic	33	15	Knapp-Sleeve	Knapp	50	400
12	Hydraulic	34	12	4 Way-Plug	.....	53	350
12	Cable	36	Unlimited	.....	.....	..	.....
12	Hydraulic	30	12	4 Way	Vickers	38	325
12	Hydraulic	30	12	4 Way	Vickers	38	325
12	Hydraulic	30	12	4 Way	.....	60	325
12	Hydraulic	30	12	4 Way	.....	60	325
12	Cable	44	Unlimited	.....	.....	..	.....
12	Cable	44	Unlimited	.....	.....	..	.....
12	Hydraulic	38	18	4 Way-Plug	Gar Wood	80	200-500
12	Hydraulic	30	18	4 Way-Plug	Gar Wood	51	200-400
12	Hydraulic	28	21	4 Way-Plug	Gar Wood	80	300-600
12	Hydraulic	32	14	4 Way-Plug	Isaacson	33	300
12	Hydr. or Cable	32	14	4 Way-Plug	Isaacson	70	300
12	Hydr. or Cable	32	14	4 Way-Plug	Isaacson	43	300
24	Hydraulic	36	10	1 Way-Foot	Northern	6	500
24	Hydraulic	28-30	10	1 Way	Northern	6	500
12	Hydraulic	24¾	7¾	5 Way-Plug	LaPlant-Choate	25	250
12	Hydraulic	31½	13¼	5 Way-Plug	LaPlant-Choate	25	300
12	Hydraulic	32	10¾	5 Way-Plug	LaPlant-Choate	25	300
14	Hydraulic	47	15¼	5 Way-Plug	LaPlant-Choate	38	400
14	Hydraulic	48	17	5 Way-Plug	LaPlant-Choate	38	400
14	Hydraulic	49	17	5 Way-Plug	LaPlant-Choate	38	400
14	Hydraulic	50	18	5 Way-Plug	LaPlant-Choate	38	600
20	Hydraulic	38	14	.....	.....	..	.....
..	.....	..	..	.....	.....	..	.....
12	Cable	36 and up	60-72	.....	.....	..	.....
12	Cable	36 or more	60	.....	.....	..	.....
12	Cable	36 or more	60	.....	.....	..	.....

CONCRETE VIBRATORS

Manufacturer	Type Air, Steam, Gas, Electric	Operating Pressure Air, Steam Lb.	Vibrations per Minute	Engine or Motor H.P.	Weight Approximate Pounds
Chicago Pneumatic Tool Co.	Air	80 to 100	7000 to 8000	..	30 to 65
Electric Tamper & Equip. Co.	Air 2¾"	60 to 100	8000 to 9000	..	20
	Hydraulic 2¾"	....x....	6500 to 7000	4	20
	Electric 4"	....x....	3500 to 4500	½	55
	Electric 6"	....x....	3500 to 4500	½	100
Flexible Road Joint Machine Co.	Gas	....x....	3500	3	...
Independent Pneumatic Tool Co.	Air	80	4200	..	†
Ingersoll Rand Co.	Air	....x....	3200 to 7500	*	39
International Vibration Co.	Air or Gas	90	4000	5	450
Mall Tool Co.	Air	80	4200	..	45
	Gas	....x....	3000 to 5000	2 to 5	175 to 235
	Electric	....x....	3450 to 10,000	1½ to 3	138 to 210
Munsell Concrete Vibrators	Air or Steam	80-100	6500 to 10,000	..	35 to 50
Master Vibrator Co.	Gas	....x....	3600 to 7000	1½ to 4	125 to 200
	Air	80	.....	..	...
	Electric	....x....	3600 to 7000	2½ to 3	45 to 75
New Haven Vibrator Co.	Air	80	3200 to 7500	*	†
White Mfg. Co.	Gas	....x....	4000 to 6000	2 to 4	210 to 330
	Electric	....x....	4000 to 6000	1½ to 2	160

*Compressor. †Varies.

These Tables Will Be Continued in Subsequent Issues

OBSERVATIONS BY THE WAY

By A. PUDDLE JUMPER

¶ Sunday night, Dec. 20, 1936, after supper, I was crossing the mountain ranges between Hagerstown, Md., and Uniontown, Pa. Rain had been falling east of the mountains but when I got to Hagerstown I ran into snow that got to be six inches deep at Cumberland, Md. About 9:00 p. m. rain started falling again. Was it a relief to see those new F. W. D. trucks with snow plows attached cleaning this slush, snow and ice off the mountain roads in Maryland? You guess. Many motorists and truck drivers can thank the highway officials of Maryland and Pennsylvania for the good guard cable construction that held their vehicles from rolling down the mountain sides. I was lucky—without chains I negotiated all the mountains and the detour that was hastily opened when four telephone poles (wires laden with sleet) fell across our paths immediately ahead just west of Hancock, Md.

• •

¶ Talking about widening, this view of the Maryland State Roads Commission at work with a small shovel is also very commendable. This picture was taken on U. S. 40 just east of Hancock, Md. The little shovel kept three big trucks going regularly. The outfit was working efficiently and effectively, according to Jas. Resley, the foreman.

¶ Puddle Jumper slipped a step in his spelling last month. P. J. admits he's usually good, but this time he got John Deere & Company's President down as "Wyman," whereas it should have been "Wiman."

• •

¶ Pennsylvania is doing a commendable job here. This is one of the groups working on the widening of Route 40 East up the mountain from Uniontown, Pa. Another gang was drilling and blasting, another widening fills. I remember the time on this mountainside when I thought something was wrong with the car because it was getting hot. The road looked level but as a matter of fact the grade was quite steep. Today a beautiful concrete road runs up the mountain and I negotiated the grade on high with little effort. This widening work will provide a place for snow banks made by plows clearing the road.

¶ There is a confusion of terminology in our field that should be cleared up. We call a firm who acts as local selling agent for a manufacturer—a distributor. This distributor sells manufacturers' equipment on some agency basis. Also, we call a big tank mounted on a truck that is used to spread bituminous materials in liquid form—a distributor. Often when discussing equipment and its sales we have to go to length to be sure the other fellow understands what we are talking about. Following was taken from a manufacturer's letter to us recently: "We will not have any outside exhibit in conjunction with our distributors." What does this man mean?

I suggest we call a bituminous truck mounted tank—a "spritzer." After all it is somewhat euphonious with the sound of the spray when the nozzle is working. What do you manufacturers think about this change? Let's call the outfit a "spritzer."

• •

¶ Suggestion for safety sign along road: "If you can't read this sign you are traveling too fast."

¶ For providing further safety on highways I have noticed little things like near Tilsonburg, Ontario, Canada, where on Kings Highway No. 3, pickets of a wire picket fence are painted white and wrapped around trees or poles that are close to the roadway. I noticed this same idea in Pennsylvania and Maryland, too.

• •

¶ Going through Massachusetts I saw a sign on the back of a car, it read "Vermont Expires March 31, 1937." The state don't expire, merely the license period for operating that car. It struck my funny bone.

• •

¶ Driving over Kings Highway No. 3 in Canada ten times in five consecutive years I have never seen a maintenance crew on the whole length, about 250 miles, and have never had to detour.

• •

¶ What do you understand by the word "types" when speaking of road surface types. I'd appreciate a listing of the various types as you understand the nomenclature.

• •

¶ Marking on pavement on Route U. S. No. 1 in Virginia showing how traffic is directed to right as brow of hill is approached where sight distance is inadequate. This marking was on the two lane road between Washington, D. C., and Richmond, Va.

¶ Just east of the residential section of Sandusky, Ohio, I found a mile of Safety Educational Highway, a portion of which was lighted with the yellow sodium lamps. The following pictures give an idea of how the signs were placed along this new 3-lane reinforced concrete road.

Another safety idea I noticed in Sandusky was at sidewalk crossings near the Barker School where school boys were holding a 12 or 14 inch square red flag across the right hand side of the street to stop travel. The flags were nailed onto a 10-foot bamboo pole. After the children got across the flags were raised.

• •

¶ Note to Chief Engineer Smith of Maryland, Chief Engineer Temple of Pennsylvania, Chief Engineer Anderson of Ohio, and Chief Engineer Smith of West Virginia:

Suggest you commend activities of your night snow-fighting and cindering and sanding crews. Except for that long hill just west of East Liverpool, Ohio, most all hills were well cleared and sanded in that reecnt snow storm that covered Ohio eastward through the mountains. Night work was mandatory and the crews were on the job. Couldn't they do faster and better work if they used spreaders instead of hand shoveling?

It occurs to me that snow plowing crews and sanding and cindering outfits should be equipped with motor-vehicle wrecking hoists for hauling ditched cars and trucks back onto the roadway during a storm. A small fee —say 50 cents of $1.00 might be charged for this service and motorists would gladly pay it.

• •

¶ "The nation's greatest safety campaign cannot achieve ultimate success until license and patrol measures have culled out the habitually dangerous drivers, and until at least as much attention is paid to the education of motor vehicle operators as is now paid to educating firemen of stationery steam boilers.

Experts in the building of safe highways came to the conclusion at their San Francisco meeting that from now on the greatest saving in life and limb can be accomplished by: first, education of all drivers of motor vehicles, and second, elimination of habitually reckless, incompetent, or dangerous drivers from the highways through extension of the work of highway patrols and tightening of drivers license requirements."—Minnesota Highway News.

• •

¶ Have you seen the beautiful state maps put out by Michigan, West Virginia and North Carolina? Others may do so but they have not come to our attention yet. If your state publishes seasonal editions or beautified maps we would like to mention it in this column.

EDITORIAL

Some Things We Don't Know About Highway Engineering

STEADY progress in obtaining more factual data relative to highway engineering is lifting the profession to higher standards. We talk easily, albeit uncertainly, about the economics of highway construction. A true knowledge of economics requires a knowledge of actual construction and maintenance costs as well as a definite knowledge of service lives of highway structures.

Engineers will say that they have accurate maintenance costs. What they have is a record of money spent on maintaining roads under their jurisdiction but not to any uniform standard, considering the country as a whole. Maintenance funds are usually budgeted to the maintenance department to care for the roads during a certain period. The money is spent and subdivided in the accounts according to the bookkeeping set-up of that organization. At the end of the year the miles covered are divided into the money spent and the result is claimed to be the cost per mile for maintenance. But there is such a lack of uniformity as to what is maintenance and what are betterments that the figures, when used by others are misleading. We are prone to record our results in costs per mile regardless of width, construction type, span, thickness, or traffic density.

Until we have data at hand over a period of years on maintenance costs for various types of construction, comparable with like construction where traffic is variable, the road maintained to a definite standard regardless of the budget, recorded uniformly regarding betterments and reduced to some common denominator we will have no comparable data; no true basis on which to apply our theories of the economics of highway construction. A unit of comparison for maintenance costs might be suggested as the cost per mile, per foot, per inch, per vehicle. In other words, maintenance costs reduced to a unit of cost of maintaining a strip one mile long, one foot wide, one inch thick and carrying one vehicle.

All engineering has for its main object the doing of a certain specific work at the least cost. Here the word "cost" is used, not in the sense of immediate outlay, but as the total outlay over a period of time. The period of time and the specific work are inter-related as to type or grade of work to be done.

The bridge engineer is carefully schooled in the science of stresses and strains. Why? So that he can design a crossing that will result in the least cost. This is an application of economics in highway work. When it comes to surfacing, though, we are confronted with a different condition of basic knowledge. Most of our highway engineering has evolved from empirical practices. Our fundamental data are incomplete. True, we have experimental data and service results to use for some of our surface types; portland cement concrete being probably the most complete. By making certain assumptions and not deviating too far from empirical standards, we are able to produce an acceptable design for surfacing. We cannot say definitely, however, in all cases, that the use of that type of surfacing is the most economical. We do the best we can—assume this, estimate that, take what we have for the other item and then calculate a result. Why can we not say that the design is economical? Because we do not have service life data or maintenance cost data that are correlated with traffic densities.

We need data, also, on the effect of stabilized subgrade on surface thickness, on the relationship between subgrade rolling and surface thickness. We need comparable data on the costs of resurfacing. Rate of depreciation is a function of service life about which there is a lack of data. Is there a known relationship between surface smoothness and a resurfacing period? By what measurements can we determine when a surface should be made smooth again?

Often we come to what seems like disagreement because of misunderstanding of terminology. We need an authority established to which we can refer terms for clarification or definition so that the word conjures the same concept in all of our minds. For example, you are talking about earth moving equipment and someone suggests that wheel scrapers be used. Just what unit is he talking about? Another man says he uses a distributor to do a certain job. Does he mean a man or a machine? He then qualifies his statement in the light of common usage and says he means a bituminous distributor. There is no such thing. Bituminous is an adjective; he probably meant bitumen distributor. Again, the conversation might turn to surface types. A fair gamble would be that five men in the highway field, picked at random, would not catalog or list the "types" the same.

While the list of things we don't know about highway engineering may be long, the bright side of the picture for the consolation of the profession of highway engineering is that the engineer's analytical mind is constantly reducing this list. Empirical data are constantly being correlated with experiments and assumed data are continually being verified or corrected by engineering studies. We anticipate that 1937 will contribute a larger share of elemental data than did previous years.

Why Advertise?

REFERENCE was made at a recent meeting I attended, where Ames Engineering Alumni were having a dinner in Chicago with senior engineering students who were on an inspection trip, to the production and income phases of business. It struck me as odd to divide a business this way because, as I see the picture, the whole business is a production proposition. In one case, part of the staff produces a commodity, in the other case the rest of the staff produces orders. Orders for commodities don't just happen. Balanced, geared, well-analyzed production plans are indispensable for economic production of orders.

The salesman is the master mechanic of order production, the man who assembles all of the parts of order production together into the finished product—a sale. The various parts must be balanced before an economical order can be produced. The sales organization must be complete, the commodity must be ready for shipment, the markets to be sold must be analyzed for possibilities, and the tools of order production must be skillfully employed. The latter is advertising. Advertising is the tool of the skillful order producer.

Once a business man starts to produce orders in a certain market or field, he invests good dollars in promoting his commodity to serve that field. This expenditure is a production plant investment, for order production, just as truly as expenditures for lathes, planers and drills are plant investments for production of commodities. In the case of advertising expenditures, the items purchased are commodity acceptance and good will. These elements are fundamental to order production.

Lower commodity production costs have resulted from engineering analysis of raw materials, from elimination of waste motion and lost time, from larger quantity production, and employment of modern production tools. Lower order production costs can result from analyses of markets, from elimination of waste sales efforts, from larger quantity of order production, and from employment of modern selling tools.

Modern selling tools are many and varied but the principal one is advertising. The order producer must tell the consumer about the company's commodity. His chief way of doing this is by advertising. The more skilled the selection of the advertising tool, the more economical will be the cost of the order produced. Advertising is for selling what the modern plant tool is for commodity production. Advertising lowers the cost of order production just as modern plant tools lower the cost of commodity production.

Larger sales volumes are produced without excessive sales costs just the same as larger commodity productions are made without excessive commodity production costs through skillful employment of modern tools.

Salesmen—master mechanics of order production—must know how to use advertising to lower their order production costs. ROADS AND STREETS advertising pages is one of the salesmen's modern tools for producing low cost orders in the highway, street, bridge and airport fields. These pages do double duty. They serve the manufacturer and reader, both; however, for different purposes. ROADS AND STREETS readers use the advertising pages to enlarge their knowledge of materials and equipment, to keep posted on types available, to add to their information on equipment and materials efficiency, and to keep informed on improvements in materials and equipment.

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Were You There?

"NO?" Then, Mr. Manufacturer, how did you know that Maryland was going to purchase those new trucks or new power shovels? You seem to be pretty well posted on possible equipment sales in Mississippi. Yet you haven't visited either of these places. You were not out to Hastings, Nebraska. How did you know about those bridge jobs and road relocations on the Central Nebraska Public Power and Irrigation Project? Who foots it over the country for you? Mr. Reader, who travels for you, too? "Nobody," do you say? You seem to be familiar with these opportunities and projects, yet you haven't been there lately.

The point of this is that men are always traveling for you. They are on the road all the time. For some of them it is their principal duty, for others, incidental to their regular selling.

In the first group are the editors of ROADS AND STREETS. They function for you, not as men who pretend to know it all, but as eyes, ears and feet for you—reporters. They dig up facts that they know you would record if you were there. They travel about a great deal to keep an eye out for developments that would interest Contractor Jones, Engineer Smith, or Commissioner Brown back home if he were along and at the same time analyze the market possibilities of various programs for Mr. Equipment or Materials Manufacturer. They report the facts and reasons back of them, they take action or job photographs to give you visual information on the project, they have line drawings and sketches prepared to illustrate certain points. Then, in their characteristic way, they assemble these things into a readable report or article and supply you with the data in two ways, via the postman and by personal calls.

Thus you are kept posted monthly on latest developments, trends, theories, and work done by others.

In the second group are Mr. Manufacturer's own sales force and engineers, whose principal jobs are sales and field service. These men keep quite close contact with their own territories. They are, naturally, concerned with their own products, and through them the head office is kept posted on operation of their equipment. Compliments and criticisms travel back home through them. Their suggestions or reports cause home office study that results in new or improved equipment.

Again, ROADS AND STREETS, following these developments, brings you the information about this new equipment both in its reader pages and its advertising pages. From the manufacturers' advertising you learn about performance of a certain unit that you have contemplated purchasing. Records of performance and data about the equipment or material are displayed by the manufacturer. In the advertising pages he tells his story to you.

Certainly, the men who dig up and report factual information on various programs and projects are traveling for you as truly as if they were listed on your payroll.

EQUIPMENT REVIEW SECTION

Developments in Equipment and Materials During 1936

GRADERS, PLANERS AND MAINTAINERS

York Modern Corporation Produces New Road Machine

"Master Workman" is the name given by York Modern Corporation of Unadilla, N. Y., to their all-purpose, hand operated maintainer produced in 1936. The unit enters the lower priced field and medium requirement range, and is a combination of scarifier, blades and rake, for use

The York "Master Workman."

where light wheel or crawler tractors or light trucks are to be used for power. It weighs approximately 4,200 lb.; has a wheelbase of 13 ft.; electrically welded unit structure heavy steel frame; pneumatic tired wheels with Timken bearings; and enclosed machine cut gears. The scarifier head is fabricated from heavy steel plate electrically welded and has eleven heat treated special alloy steel teeth; the blade unit consists of two 10-in. reversible moldboard shaped blades; and the rake, an exclusive York feature, is the single section type with an all spring steel framework and tough spring steel heat treated teeth.

▼

A Planer Attachment for Rollers

A hydraulically controlled planer attachment for use with 6, 7 and 8-ton rollers was developed by Austin-Western Road Machinery Co. of Aurora, Ill. The attachment consists of a 7-ft. blade and is designed for use in finishing subgrade and other types of grading where rolling is required. A 2-ft. extension may be added at either end if desired. The blade bit is reversible.

The blade may be set to remove excess of material at any height and may be set straight across the machine or angled to allow material to windrow to the left of the roller.

Rapid vertical adjustment is assured by hydraulic control valve operated from the roller platform and responding instantly to the touch of the operator.

The manufacturers claim that the principle of operation is parallel to that of the third axle center roll of their Roll-A-Plane, since by placing the heel of the planer on the same plane as the front and rear roll, three points are established in the same place. As a result the high spots are found and leveled by the action of the planer to create a level surface.

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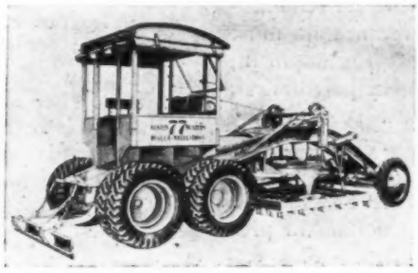
Austin-Western Motor Graders

To keep pace with modern developments and extend its range of utility the



The "77 Senior"

No. 77 Senior motor grader of the Austin-Western Road Machinery Co., Aurora, Ill., can now be equipped with 9 in. x 24 in. low-pressure tires. These new tires are claimed to not only give more ground contact than any tires heretofore available, but also have all of the traction advantages that result from the use of low pressures. They are capable of carrying higher pressures than other low-pressure tires, and provide added traction in mud and sand, as well as on hard surfaces.

Another recent development in Austin-Western motor graders is an oil mix scarifier, which is substituted for the blade and controlled by the same hydraulic controls that handle the blade. This scarifier is capable of loosening the surface of uneven oiled roads that are to be resurfaced, and is also very effective in mixing the oil and aggregate on new work.

Austin-Western motor graders may now also be equipped with a bulldozer attachment mounted ahead of the front wheels and hydraulically controlled.

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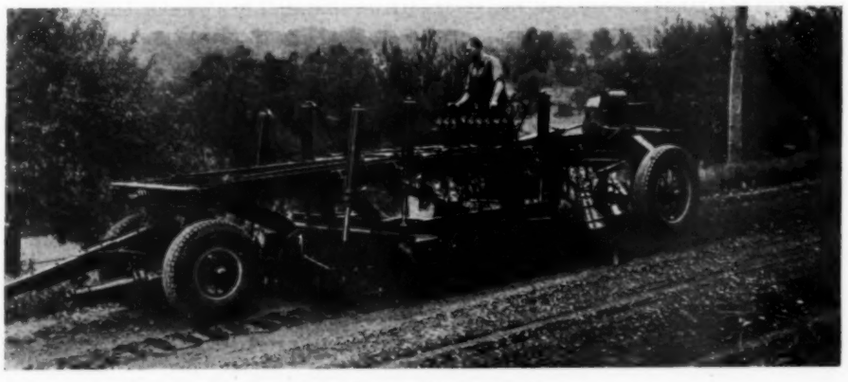
Austin-Western Blade Graders

These grades combine the advantages of leaning wheels and pivotal rear axle. The result is a machine that automatically steers away from the bank whenever the wheels are leaned, while still maintaining the desired line of travel. This effect is accomplished by an ingenious method of mounting the rear axle, which does not require any added parts.



York Modern Hydraulic Maintainer.

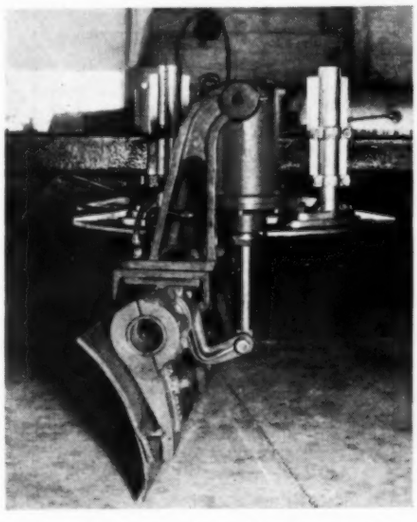
The "Hydraulic Workman"

This machine, introduced in 1936 by York Modern Corporation of Unadilla, N. Y., is a new type of heavy duty maintainer. It is designed to do all types of maintenance work on dirt, gravel, crushed stone and stabilized gravel roads and is adapted to rebuilding roads of this type as well as black top and macadam. The most important feature of this machine is its large capacity and ease of operation due to the hydraulic controls. The hydraulic cylinders are the double acting piston type; the control valves are 4-way packless; the pump is a well known gear type; and the engine is standard make air-cooled, developing 3.9 H.P. All adjustments, including steering, are made at the touch of a lever.

The Hydraulic Workman weighs approximately 10,300 lb.; the wheelbase is 19 ft.; the frame is fabricated of structural steel angles electrically welded; pneumatic tired wheels with Timken bearings are standard equipment. The scarifier is fabricated of steel plate; electrically welded, weighs 1,000 lb. with teeth installed; mouldboards are 18 in. wide with 6-in. cutting edges; the rake is of all spring steel construction with special alloy heat treated spring steel teeth.

Curved Blade Arms for Road Planer

During the past year two major improvements were made to the pneumatic road planer of the Pneu-Hydro Road Machinery Co., Cadillac, Mich. One of these was the "blade stop"; the other was the "curved" blade arms. The blade stop is a device attached to the ends of the tube, and which can be adjusted so that the blade will cut only so deep and no deeper. The purpose is to set the blade at a predetermined point so that the operator can spread loose gravel or work the roads in wet weather without digging out the soft spots. The curved blade arms are used with the curved moldboard and cutting bits.



Curved Blade Arms for Pneumatic Road Planer

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Monarch Undertruck Road Maintainer

The improved undertruck road maintainer of the Monarch Road Machinery Co., Grand Rapids, Mich., is illustrated herewith. A special feature of this maintenance is the horizontal compression springs with patented blade arm assemblies hinged and locked against lifting, digging, gouging, chattering or washboard effects.

Monarch Undertruck Road Maintainer.

The oscillating hydraulic cylinders are horizontally mounted between parallel trunions clamped to the rock shaft, the piston rods being anchored to a crosshead extending from the channel beam. Hydraulic pressure forces the working edge of the blade against the road surface.

The controls are compactly arranged in the truck cab within easy reach of the driver the Monarch designed hydraulic pressure pump quickly lowers the scraping blade to the road surface. Varying pressures up to 1,500 lb. per square inch (indicated on a graduated gauge) may be exerted. A release valve automatically raises the scraper to clear 8 in.

The maintainer also may be operated by means of an electric hydraulic pump unit which receives its power from the truck battery.

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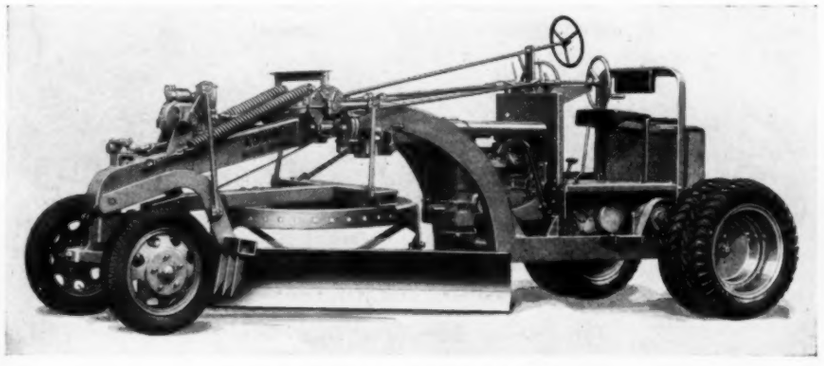

Adams Motor Grader No. 20

New Adams Motor Grader

A new low-priced motor grader announced by J. D. Adams Co., Indianapolis, Ind., is powered by the International I-12 tractor with a 22½ H.P. engine.

A special, heavy-duty, one-piece rear axle is provided, driven by two large roller chains from the tractor axle. This chain drive between the tractor axle and the driven axle, according to the manufacturer, effects a speed reduction which increases the pulling power of the tractor 65 per cent. The three working speeds of 2, 3.5 and 6 m.p.h. are variable by foot and hand throttles. A speed of 7.5 m.p.h. is possible when machine is traveling empty.

The narrow all-welded frame is of the box-type that has been tested and proved so successful in Adams leaning wheel graders and heavy-duty motor graders. It provides extraordinary strength and rigidity and gives the operator an unobstructed view of the blade. Machine-finished ball and socket connections and a machined full circle allowing close fits with adjustments for wear offer an insurance against lost motion and blade chatter.

Two hand-wheels within convenient reach of the operator raise and lower the blade. A simple gear transmission allows the right hand-wheel to operate the scarifier if the machine is so equipped. The side-shift of the blade is accomplished by a hand crank on the left side of the machine which operates a sliding bracket and side-shift link. The crank may be locked in any position by a hinged fork.

Standard equipment on this new machine includes 9-ft. blade and the approximate weight is 8,300 lb.; 10 and 12-ft. blades, scarifier, canopy top, enclosure, starting and lighting equipment and other accessories may be had as optional equipment.

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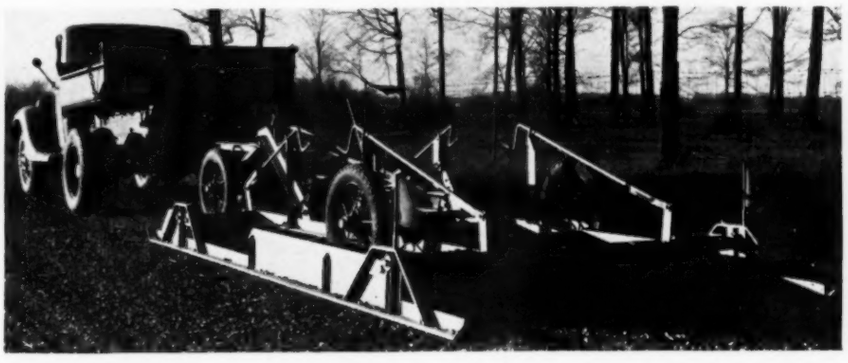
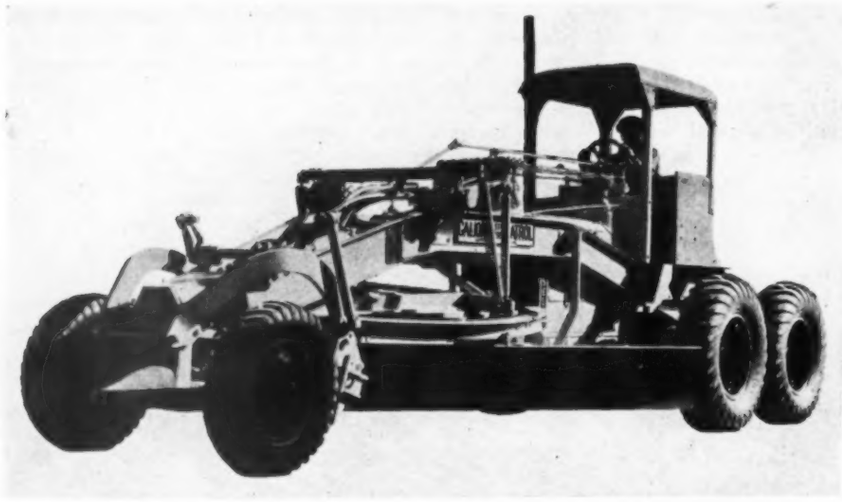


Galion No. 6 Planer.

New High-Speed Road Planer

The Galion No. 6 Road Planer is a light high efficiency unit for use behind a 1½-ton truck. The planer is readily portable, as the lift device raises the multiple blade section and frame so the planer is supported on the pneumatic tired wheels. The same truck that is used to tow the planer to the job is used to pull it while working the job. It is adapted to work on bladeable material on roads, pikes, drives, race tracks, flying fields, athletic fields, etc.



The New One-Man Master Diesel Grader.

Galion Master Diesel Motor Grader

This grader, newly produced by Galion Iron Works, combines the qualities of the well known Galion One-Man Graders with the efficiency of International Harvester's TD-40 Model Diesel power unit. Starting of engine has been greatly simplified and made practically automatic. Equipped for either hand cranking or with starting motor, the engine, after starting runs a few revolutions as a gasoline engine; then automatically shifts over to Diesel operation. The grader can be equipped with various lengths of moldboard, with several types of scarifiers, with snow plow, with wheel and of exceptional ease of operation. The to do. Controls are conveniently located and of exceptional ease of operation. The Galion hydraulic control system being used on the full range of controls, finger touch levers take the work out of this grader's operation. Operator's cab is offered in open, canopy, and with either curtain or glass enclosure. Front wheels are provided in either standard or wide tread, straight or leaning front wheels.

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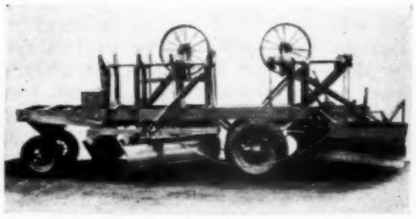
Allis-Chalmers Tandem Drive Speed Patrol.

New Tandem Drive Speed Patrol

The Allis-Chalmers Tanden Drive Speed Patrol, introduced early in 1936, comes in two sizes—Model 54 being available with a choice of Diesel fuel, distillate or gasoline burning motors, and Model 42 with either a gasoline or distillate burning motor. There is a choice of either a four or eight-wheel drive in both models. The tandem assembly pivots freely on the rear drive axle keeping all wheels in constant contact with the ground under all conditions. Other important features are the extra long blade base which gives maximum effective blade pressure, large circle for frigid moldboard mounting, wide front axle for greater stability, ball and socket connections and wear take-up provision at vital points. Positive breaking action on all rear wheels is accomplished with internal expanding Lockheed hydraulic brakes, controlled by foot pedal in the cab.

Retread Machine

A retread machine that mixes, windrows, spreads and edges, was brought out by The Parsons Co., Newton, Ia. The machine retains the Parsons' "Vane" action of mixing, but has added the other devices.



The Parsons Turbo Retread Machine

The machine works on the system of quick turn-over and rapid discharge. It covers 9 ft. 6 in. width and is stated to handle mixes up to 8 and 10 in. deep. The exact adjustment of the spreader and edging units is claimed to leave an even layer of any desired depth ready for rolling or traffic packing.

The windrow blades adjust laterally about 10 in. so as to form a larger or smaller windrow according to volume of material. The rear spreader can be pressed on the road subgrade to completely clear off the material or adjusted upwards accurately for any desired depth of spread.

The machine turns around readily on the average road. All the units are lightly balanced by counter-springs so that control by one man is convenient. A 60 H.P., or larger tractor, gives the best results, but on very light spreads on level roads a smaller tractor, or even a heavy truck, in low gear, has been used.

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SCRAPERS AND BULLDOZERS

Bullgrader and Bulldozer by Bucyrus-Erie

Modern simplicity of design, together with unusually fast and powerful hydraulic blade action are the outstanding features of the Bullgrader and Bulldozer —the two first units in Bucyrus-Erie Company's new tractor equipment line.

The name "Bullgrader" is exclusive with Bucyrus-Erie Company, and as it implies, designates the double-purpose unit which can be used both for grading and for bulldozing. The Bullgrader blade may be angled quickly to the right or left for continuous side-casting, or it may be set straight across for bulldozing. The blade may also be tilted for filling, terracing or establishing a grade.

A more efficient use of the tractor's power and maneuverability is claimed for both the Bullgrader and Bulldozer, through the balanced design of these attachments which do not materially affect the tractor's center of balance. A rugged, box-welded frame eliminates the need for rubbing plates and transmits the full load from the blade to the tractor track

frame at the two points designed to take it. The large, twin, hydraulic cylinders which power the blade action of both the Bullgrader and Bulldozer, operate at low oil pressure—350 lb. maximum. A

This Bucyrus-Erie Bullgrader, Mounted on an Allis-Chalmers Tractor, Belongs to Brelenthin Brothers of Ashland, Wis., and Is at Work on a Highway Near That City.

single control, conveniently placed for the operator, enables him to raise, lower, hold or float the blade. He commands a blade travel speed of 32 in. in 3 seconds. Pressure release ports, exclusively used by Bucyrus-Erie Company on both these units, automatically cut off the hydraulic power when the blade reaches its highest or lowest position.

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10-Yard Wagon-Scraper

The Tractor Equipment Division of the Continental Roll and Steel Foundry Co., East Chicago, Ind., added a new 10 yd. wagon-scraper to their line of tractor and road building machinery.

Continental's New 10-Yd. Wagon-Scraper

This 10 yd. wagon-scraper, known as Model CS10A, is the full carrying type tractor scraper, identical in design and appearance to the Continental 5 and 7 yd. wagon-scrapers, and embodying the same general operating features.

It is ruggedly constructed throughout of "Dynamic" heat-treated alloy castings, alloy heat-treated shafts; the digging bucket, the patented front apron and rear dump door being fabricated of special steel plate, arc welded into strong one-piece units. Overall length is 16 ft. 9 in., width 11 ft. 9½ in., height 6 ft. 9 in.

This new 10 yd. Continental, built for use with 75 h.p. and larger tractors, is especially designed for digging, loading, hauling and dumping the tough clays and gumbo soils, shales, hard pan and rocky soil as well as the loams and sandy clays, etc., and other soils commonly called "good scraper dirt."

24-Yd. Carryall Scraper

A 24-yd. carryall scraper for use with large-size tractors was placed in production by R. G. Le Tourneau, Inc., of Peoria, Ill., and Stockton, Calif.

This carryall is a telescopic scraper with a capacity of 24-yds. loose measure. The body proper consists of five buckets, one

Le Tourneau 24-yd. Carryall Scraper.

within the other. As the buckets fill, they are pulled back from the cutting edge by one line from a Le Tourneau four-drum power control unit until they form one long, evenly-filled bucket. Thus, it is stated, the dirt is always loaded into an empty bowl with no tractor power being expended for pushing material up through dead earth. It dumps and spreads with the same ease and accuracy that characterizes the Le Tourneau 12-yd. carryall.

Tires for the new unit are 18.00x24, mounted in four dual sets.

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12-Yard Carryall Scraper

A new model 12-yard carryall scraper, the Type "Y," for use with RD-8 Caterpillar tractors, was announced by R. G. Le Tourneau, Inc., Peoria, Ill., and Stockton, Calif.

In design the new model is quite similar to the company's former 12-yard carryall.

Le Tourneau New 12-Yd. Scraper

It is cable-controlled by means of a 2-drum Le Tourneau power control unit mounted at the rear of the pulling tractor. It embodies the same positive, accurate unloading method, namely, use of a sliding tailgate to force material out of the bowl. The cutting blade of 10 ft. in width, bowl dimensions, and dirt-carrying capacity are the same.

The major change is in the tire size, which has been increased from 13.50x20 to 18.00x24. The larger tires greatly reduce draft on the tractor and provide a much larger ground contact. Four 18.00x 24 low-pressure tires are standard equipment on the Type "Y," but duals on the rear and singles in the front, or duals both front and rear, are optional at extra cost.

To accommodate the larger tires, the front yoke has been heightened, resulting in greater clearance and easier turning. The return spring assembly is housed in the tailgate itself, and the reserve cable reel is mounted atop the tailgate, making it handier to pull new cable through the sheaves. The ball bearings in these sheaves are especially designed with a built-in, absolutely dust-proof seal, which insures free rolling cable and long bearing life.

As with the former Le Tourneau 12-yard models, the Type "Y" can be operated in tandem behind a single tractor equipped with a 4-drum power control unit. The rear drawbar for tandem hookup is standard equipment.

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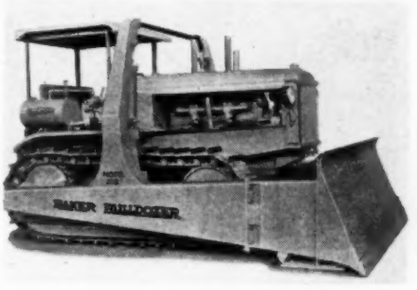
Baker Bulldozer

Hydraulic bulldozers of the Baker Manufacturing Co., Springfield, Ill., during



Baker Bulldozer Model 215.

1936 were built to still greater degree of refinement in construction and in operating efficiency. Twin cylinder operation and direct lift continue as leading features of all models. Tremendous down pressure (utilizing entire weight of front portion of tractor) extremely high lift, correct mounting on tractor, and rugged moldboard with interchangeable features are some of the salient points of the bulldozers.

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Front-End Power Control Unit

A front-end power control unit, designed particularly for users who want a power unit that will operate angledozers or bulldozers, yet leave the rear of the tractor free for mounting logging winches or other similar equipment was put on the market by R. G. Le Tourneau, Inc., Peoria, Ill., and Stockton, Calif.

The power control unit, compactly built, is mounted at the front of the tractor and takes its power direct from the motor crank shaft through gears. Like all Le Tourneau equipment it is operated from the tractor seat by means of a convenient lever.

The entire unit is stoutly constructed by electric arc welding of special alloy steel. No castings are used in any part of it. Timken and Hyatt bearings assure fast, free-running operation and the same trigger-quick action that characterizes the standard Le Tourneau power control unit.

CRANES AND EXCAVATING MACHINES

Bucyrus-Erie Company Announces Its New 19-B 5/8-Yard Excavator

With the announcement of its new 19-B, Bucyrus-Erie Company of South Milwaukee, Wis., adds a 5/8-yard excavator to its line—a companion to its 10-B, 3/8-yard machine. The 19-B weighs 16 tons. It offers a travel speed of 1¾ M.P.H.; swing speed of 4¾ R. P. M.; and a hoist line speed of 184 F.P.M. It is available for gasoline, electric, or Diesel power. Because of its compact design, the 19-B may be moved from job to job as fast trucking speed on a special

Bucyrus-Erie 19-B Excavator at Work on Two Very Different Jobs.

trailer available for it. Like the 10-B, the narrow overall width and short tail swing of the 19-B permit normal operation in tight quarters, in traffic, in narrow alleys, or close to a wall or bank. Seven types of front-end are available, making it possible to convert this machine quickly and easily to the type of operation best suited to the job. With the simple addition of front-end equipment, it can be changed from shovel to dragline, clamshell, lifting crane, dragshovel, skimmer, or backfiller.

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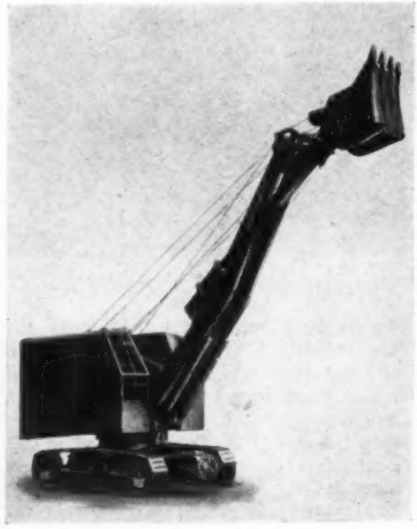
New ¾-Yd. Shovel

A new ¾ yd. shovel was announced by the Northwest Engineering Co., 28 East Jackson Blvd., Chicago, Ill.

This machine will be known as the Model 25, and is fully convertible from shovel to crane or dragline by simply changing booms. The outstanding characteristic claimed for this unit is speed. Every effort has been made to assure fast action in all functions. Its design is similar in general to the recently announced Northwest Models 15 and 18, but it is larger and heavier throughout.

Bases are of cast steel. Side frames are cast integral with the rotating base. Travel gears are fully enclosed and the whole crawler design is engineered and built exclusively for shovel service.

The "feather-touch" control—which assures easy operation, and the cushion clutch—which limits the hoist rope pull to a definite value, are standard equipment. Swinging clutches are of the cone type.



New Northwest ¾-Yd. Shovel

They are smooth acting, non-grabbing, and are cool running.

All high speed shafts are mounted on ball or roller bearings, and the power take-off is through helical gears running in oil in an oil tight housing.

Regular power will be a Wisconsin 6-cylinder gasoline engine, but electric or Diesel power is available.

The shovel equipment will be the standard Northwest welded boom and welded dipper stick equipped with a manganese ¾-yd. dipper.

A full cab is standard equipment, and all operating parts above the deck are accessible within the cab.

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New 1-Yard and 1¼-Yard Excavators

Additional new models in the excavator group were announced by Koehring

The "403" Koehring Excavator.

Company as the "403" and "503." Enclosed gears and anti-friction bearings, with selective swing speeds, make easy operating excavators of these 1-yard and 1¼-yard shovels.

Two New Northwest Shovels

A ⅜ cu. yd. shovel and a ½ cu. yd shovel both of connected type, were announced by the Northwest Engineering Co., Chicago, Ill. They are known as Models 15 and 18, and they are full revolving and are mounted on full length crawlers. The cab is a complete enclosure with space all the way around the operating machinery and giving ample inspection room and working space for maintenance. The front part of the cab is cut away to assure full vision to the operator.

The operating machinery is mounted on a rotating base casting of unusual design. Both base and side frames are cast as a unit. This assures maintenance of alignment of all shafts and bearings and provides a rigid frame for the operating machinery. The crawler base is also mounted on a casting and all travel gears are fully enclosed both top and bottom. Crawlers are of standard Northwest design, having bronze-bushed, enclosed-drive sprocket shaft bearing, roller-chain drive, with standard self-cleaning crawler tread and roller construction. Side frames are all welded.

The engine is an 8-cylinder Ford truck model with starter equipment as standard. This engine has been improved to meet the more rigorous service of shovel operation by several features that have been found necessary over a period of years. Ford pumping equipment which consisted of only an impeller has been replaced by oversized water pumps. The radiator is of special double tank capacity. The Ford transmission has been replaced by Twin Disc clutch and beyond this is a flexible coupling. A special flywheel is mounted in line with the crank shaft so that none of its torque is transmitted through the engine clutch.

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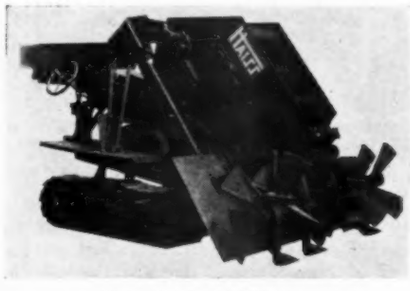
Haiss Tunnel Mucking Machine

The new tunnel mucking machine brought out in 1936 by George Haiss Manufacturing Co. of New York City is 8 ft. in overall width and 8 ft. in

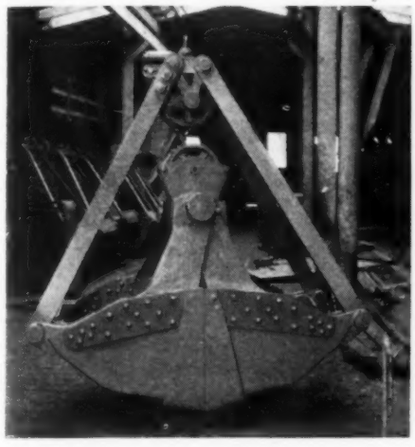


New Tunnel Mucker.

overall height. It is equipped with complete Haiss Excavator parts and with a discharge conveyor which is of the proper height for loading into mucking cars. This excavator as built is equipped with only one feeding shaft in the normal position. If desired, the machine can, however, be equipped with a second digging shaft mounted over the standard regular shaft for the purpose of breaking down the upper half of the 8-ft. high face.

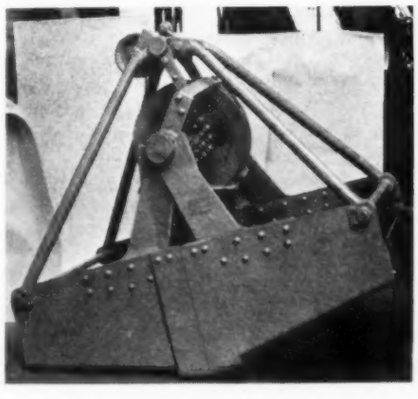
Two New Buckets by Haiss

Haiss Hi Power Digging Type Bucket—These clam shell buckets have a new contour of the bowl and a new type of headpiece with very large 4-way roller guides with a closing line. On a 1-yd bucket, the jaws are 1¼ in. x 10 in., made of Lukens Abrasion Resisting Steel, .28 to .38 carbon, 80,000 tensile strength and 150 Brinell Hardness. The bucket



Hi Power Digging Type Bucket

is equipped with five digging teeth of very heavy characteristics of the proper angle for digging. These castings are made of Farrell's 85-Grade "T," that have a tensile strength of 85,000 lbs. per sq. in. and elastic limit of 55,000 lbs. per sq. in., Brinell hardness 165 to 180. The blade arms are



Haiss Latest Type Snow Bucket

very rugged cross section steel castings with large bearings and a heavy type bronze bushings. The sheaves on a one-yard bucket are 14 in. in diameter scored to accommodate up to ⅞ in. rope. On a one-yard bucket, the head piece accommodates 3 sheaves, and 4 at the bottom lead and this permits very heavy digging, but when light digging is encountered the bucket can be reeved up for 2 sheaves at the top and 3 at the bottom. The head piece is equipped with a wedge block so that the change can be made in a minute.

Snow Bucket. The bowl is built of one piece of the open end type and the rear section is welded and flanged for stiffness. Heavy steel jaws are used for cutting edges and also stiffness for the bowl. Cast steel arms are also used on account of their stiff qualities, and closing mechanism consisting of the power wheel type with overlapping chain. This type of wheel has a very high ratio of closing power when digging starts and a quick opening when it is desired to discharge the material. The wheel is a steel casting made of .40 carbon steel, tensile strength 80,000 lbs. per sq. in., elastic limit 45,000 lbs. per sq. in. with a Brinell hardness of 175. The shafts are HMS Steel with a tensile strength of 103,000 lbs. and 196 Brinell hardness.

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New Osgood Shovel

The outstanding development of The Osgood Co., Marion, O., was its new Invader, a full revolving chain crowd shovel, convertible to dragline, clamshell, crane, backhoe, or skimmer service. The machine may be mounted either upon continuous tread crawlers or a commercial truck chassis.

The Invader equipped as a chain crowd shovel, equipped with a 10 cu. ft. struck

The New Osgood Invader

measure dipper, weighs approximately 23,-7000 lb. It has four travel speeds giving it a range of from approximately 1 to 4 miles per hour; and it has a rotating speed of approximately six revolutions per minute. It is powered with a large 6-cylinder, heavy duty gasoline or Diesel engine or an electric motor. The fuel tank capacity is 64 gal.

The rotating platform is a one-piece alloy steel casting. Two control units which are mounted on the cast steel deck contain the multiple disc clutches, hardened steel gears, spiral cut bevels, and special steel shafts which are completely enclosed and run in oil. The oil is constantly pumped from a central reservoir to these units, circulated through them and returned to the reservoir maintaining the oil in the units at proper levels. These two units control the travel and crowd and the swing and doom hoist operations of the machine. The machine has independent swing and travel motions; chain crowd self-adjusting to all boom angles; A-frame and machinery deck of alloy steel each cast in one piece; friction steering and digging locks controlled from the upper deck at the operator's position; crowd brake; live boom hoist; power dipper trip; and many other important features.

Browning Mobile Wagon Crane

A mobile wagon crane, that is a sort of intermediate between the crawler crane and the truck crane, was put on the market by the Browning Crane & Shovel Co., Cleveland, O. It is stated that the machine with its short turning radius, it competes with the crawler crane in its ability to go around sharp corners and with its one man operation, who from his seat in the cab controls all of the functions, including traveling and steering. Due to its relatively high travel speed, it is claimed to come in the truck crane class as far as mobility is concerned. It can be readily moved from one distant point to another by simply disconnecting the traveling mechanism, a matter of but a few moments, which permits it to be towed at any speed behind a truck.

Every function of this crane is separately or simultaneously operated which makes it very fast in any kind of work.

It is designed to interchangeably handle a hook block, clamshell bucket, dragline bucket, shovel dipper, back hoe, pile driver leads, or what not, with no change back of the boom feet other than the change in the drum lagging to suit the speed to the operation being performed.

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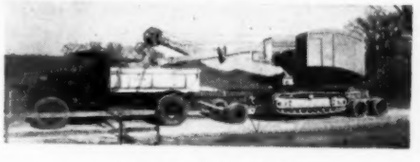
Koehring Presents ⅝-Yard Shovel for Miscellaneous Work

Early in 1936, Koehring Company, Milwaukee, Wis., introduced "The 251," ⅝-yard shovel for the miscellaneous types



The Koehring 251.

of work commonly encountered by contractors. High speed for maximum production, simplicity of operation, enclosed gears, and anti-friction bearings for low upkeep cost are characteristics of this machine.

▼

New Model Bearcat Jr. Shovel

The 1937 model Bearcat Jr. manufactured by the Byers Machine Company of Ravenna, O., features a newly designed, modern cab which gives complete protection to machinery and increased operator efficiency. Decreased gas and oil consumption are claimed for the new machine. By eliminating dead weight, this ¾ swing shovel is now light enough to be transported on a heavy duty truck. On its own specially designed trailer, Bearcat Jr. can be towed at speeds of 30 to 35 m.p.h. By employing an automobile type transmission, the operator has three travel speeds and variable digging speeds from the 36 H.P. industrial type, slow speed motor. This 1937 model can be used as shovel, clamshell, dragline, crane or trencher.

Two New P&H Excavators

Two new excavators were brought out by the Hornischfeger Corporation, Milwaukee, Wis.—a new Model 455, 1 cu. yd. machine and Model 705, 1½ cu. yd. machine.

Specifically designed as an all purpose machine the weight of the 455 is radically reduced by the use of new high tensile steels and electric "Smootharc" welding. The machine is provided with two speed

Model 705

transmissions for every movement in travel and digging.

Standard tractor type crawlers are used. Shoes are replaceable without disturbing or renewing the links in the crawler track.

Quieter, yet more efficient power is secured by the use of helical-cut gears in both reductions of hoist mechanism. Two speeds assure accurate inch by inch spotting so necessary in such crane work as placing of structural steels without the necessity of re-reeving the hoist cable. Two hook rollers are used on the front end of the large roller circle and four swivel hook rollers revolve on the underside of the roller rack to counteract all strains and eliminate pull on the center pin. Fast and easy control is increased by the use of the popular automotive type foot pedals, which operate the larger brakes and clutches.

The Model 705, a 1½-yd. full revolving

Model 455

machine, was built especially for Diesel power. Completely designed to take advantage of the newest developments in high tensile alloy steels and the use of "Smootharc" Welding, considerable emphasis has been laid upon weight reduction.

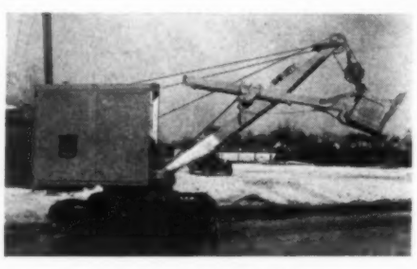
A few of the outstanding features of this machine includes anti-friction bearings at every vital point, splined shafting, all nigh speed gearing is double cut from best heat treated steels, a full live roller circle of large diameter for easy swing, greater stability and longer life. Three hook rollers revolving on under side of roller track absorb all tipping strains and entirely relieve center pin of any pull for free swing with heavy dipper loads. Husky crowd mechanism—rapid reversing chain type, allows quicker spotting of dipper. Simplified control with instant response for every movement is made possible through the famous P&H absorbent action, protecting machinery against disabling jolts.

The Model 705 is powered by a Model 1300, 6 cylinder Caterpillar Diesel engine—as standard equipment. Gasoline power is also available.

▼

Bay City ⅜-Yd. Shovel

A new model full-revolving combination shovel, dragline, clamshell, crane or truck hoe was brought out by Bay City Shovels, Inc., Bay City, Mich. The model 20 has a full ⅜ yd. bucket capacity and can handle safe 4-ton crane loads. Some of the features of this new model are: Compact design—yet plenty of elbow room. Elimination of useless "dead weight" by alloy



Bay City Model 20

body and machinery table of nickel-manganese steel, totally heat treated. Six cylinder gasoline or diesel power—"E-Z" clutch control. Cut helical gears on all drum shafts—helical gear drive, in oil. Safety worm boom hoist—positive spring lock—cab in any position. Positive propelling lock—all controls from operator's seat.

The model is built with sturdy chain crowd, split sticks and heavy box type pendent. Drop forged crawler shoes (14 in. wide), long wearing life. Unit cast car steels and heat treating. Anti-friction bearings. Chain crowd, positive and indeelectric welded boom. Sticks are of heavy tubular construction, ship channel and welded plate, with manganese crowd rack, in sections, bolted and spot welded in place. The crowd chain is automatically adjusted through the patented chain tension device. This device compensates for variations in chain length according to boom angle. It also absorbs part of the shock of crowding. It is not necessary to disconnect or adjust crowd chain when making extreme variations in boom operating angle. Boom can be hoisted from level position (as in shipment on car) to its highest lift position without bothering to adjust, or add or remove links from crowd chain.

Long Range Draglines

The Koehring Company of Milwaukee has developed the "702" and "802" long range draglines especially designed for high speed operation on large drainage projects, extensive stripping areas in mines or quarries, and canal excavation. Buck-

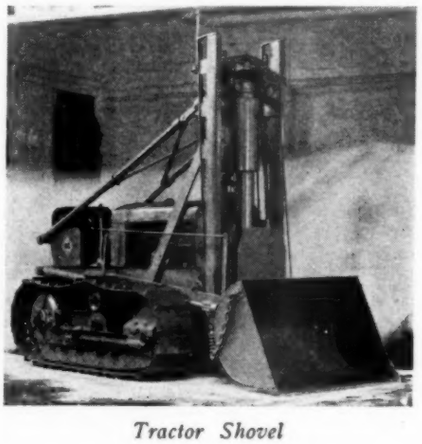
New Koehring Dragline.

ets up to 3-yard capacity for the 802 are easily handled. Important features are the substantial "A" frame, long and extra wide crawlers, swiveling boom point fairload and unusually high line speeds.

▼

Tractor Shovel

The Frank G. Hough Co. of Chicago, in conjunction with the Allis-Chalmers Mfg. Co., has recently announced a new heavy duty tractor shovel. The tractor and shovel are one unit in that they have been so designed to meet the require-



Tractor Shovel

ments of an efficient digging and loading machine.

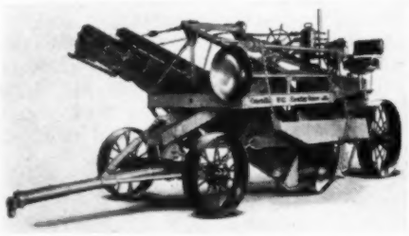
This complete tractor shovel is completely assembled, ready for duty, at the Allis-Chalmers' plant at Springfield, Ill.

A ½-yd. bucket is used on this machine which, it is stated, will dig any solid dirt or clay and raise the load to a height sufficient to dump 7 ft. from the ground.

"Caterpillar" Diesel-Powered Elevating Graders

With the adoption of Diesel power for its two sizes of elevating graders, Caterpillar Tractor Co. of Peoria, Ill., has now completely Dieselized its road machinery line.

The D4400, 4-cylinder Diesel engine is now offered to operate all power controls for the two elevating graders, known as the No. 42 and No. 48. This is the engine which powers the RD4 tractor, on which the company began production a year ago, and the No. 10 Diesel auto patrol, announced early in 1936.



"Caterpillar" No. 42 Elevating Grader. Power-Controlled.

Both the No. 42 and the No. 48 elevating graders are also available with power-control operated by either power take-off or gasoline engine.

Balance and weight distribution of these elevating graders are attained by the "A" shaped, 3-point suspension main frame, which is of strong box-type construction, and highly arched to give adequate clearance for the carrier. This frame shape and full oscillating bolster permit extremely short turning.

Both the Diesel engine-driven and gasoline engine-driven elevating graders are powered by 46 H.P. engines. The engines are mounted on a sub-frame at the left side of the rear axle acting as a counterbalance for the carrier. They are easily accessible for adjustment and repair, and have enclosed gear drives. The rear power take-off models (which are sponsored by the pulling tractor) also feature full power control.

The No. 48 Elevating Graders may be obtained with a 19, 22 or 25 ft. carrier belt length, which is 48 in. wide and equipped with a 30-in. rigid disk plow. The No. 42 Elevating Graders may be obtained with 19 and 22-ft. carrier belts which are 42 in. wide and are equipped with a 28-in. rigid disk plow.

The approximate weight of the engine driven No. 48 Elevating Graders is 19,000 lbs., and 18,000 lbs. for the power take-off models. The approximate weight of the No. 42 engine driven Elevating Graders is 16,750 lbs., and the power take-off model, 16,000 lbs.

Diesel advantages are also extended to the Diesel No. 11 and Diesel No. 10, of the four sturdy models of auto patrols. Wide front axles, leaning front wheels, V-type snow plows, and scarifiers are available as special equipment. The four models may be obtained either with single drive, dual tires, or tandem drive, single low pressure tires.

The five sizes of blade graders, known as the No. 77, No. 66, No. 44, No. 33, and No. 22 are matched in capacity with the power of the "Caterpillar" complete line of Diesel tractors. Complete power control is available in the first three graders named. There are also two models of terracers, the No. 1 and No. 2, which have found wide acceptance in soil erosion control.

▼

New Scraper-Loader

The Sauerman scraper-loader, introduced during 1936 by Sauerman Bros., Inc., 488 S. Clinton St., Chicago, Ill., is a self-propelled drag scraper machine designed for loading materials from an excavation or storage pile into trucks or other form of transport. The important attribute of the new machine, stressed by the manufacturer, is that it combines long operating range (200 to 400 ft.) with direct loading action.

The Sauerman scraper-loader is offered in two models, mounted either on crawlers or on wheels, and in four sizes with loading capacities up to 175 cu. yd. per hour. The machine is completely portable under its own power. The operator has just four simple levers to handle; two levers control the scraper bucket

Sauerman Scraper-Loader Loading Pit-Run Gravel Into Trucks.

and the other two control the steering and travel of the machine.

The accompanying illustration shows a Sauerman scraper-loader of ½ cu. yd. size, loading gravel from a pit 200 ft. wide direct into motor trucks and averaging about 30 cu. yd. per hour excavated and loaded. When moving to a new location, the scraper bucket is drawn to the top of the ramp and the lower apron of the ramp is raised clear of the ground.

▼

New Lima Excavators

During the year three new Lima excavators designated as the Type 405, Type 1001 and Type 1001-A, were announced by the Lima Lomotive Works, Incorporated, Shovel and Crane Division, Lima, O. The Type 405 is a combination shovel, dragline and crane. When equipped as a shovel it carries a 1-yd. dipper, 19-ft. boom and 16-ft. dipper handle. The Type 1001 is also a combination shovel, dragline and crane, and when equipped as a shovel carries a 2½-yd. dipper, 27-ft. 6-in. boom, and 18-ft. dipper handle. The Type 1001-A is a heavy-duty dragline only, designed for large capacity. It has exceptionally wide working ranges and low ground bearing pressure.

The new machines are equipped with drums having extra large diameters. The oversize drums prevent double wrapping when long booms are used and prolong the life of the cables.

All major motions are independent. It is possible to hoist, swing, travel and raise or lower the boom at the same time.

The shovel booms are all welded, box type construction with large diameter boom point sheaves. The dipper handles are the outside type, electrically welded throughout.

The new machines have exceptionally short tail swing. A very desirable feature when working in close quarters. Gasoline, diesel, oil or electric power is available on these machines. Anti-friction bearings are used at every important bearing point. Helical gears are used throughout the main machinery. Positive lever action is made possible through the use of square lever shafts.

The truck base is a unit casing; no structural steel nor rivets are used in its construction.

Steering is made possible through a hand wheel close by the operator's position in the cab. When increased ground bearing area is desired crawler extensions can be applied. All machines are interchangeable in the field from shovel to dragline or crane, or conversely.

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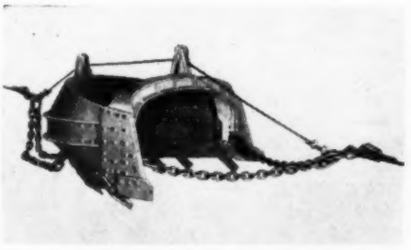
Drag Scraper Buckets

Several new models of the Crescent drag scraper bucket, manufactured by Sauerman Bros., Inc., 488 South Clinton St., Chicago, Ill., recently have appeared on the market.

Crescent scrapers in ⅓, ½ and ¾ cu. yd. sizes now are offered with a cast-steel arch type bail instead of a straight tubular bail as formerly.

In the 2 cu. yd. to 5 cu. yd. sizes, the 1937 models of Crescent scrapers have a highly developed streamline design (see



New Model Crescent Drag Scraper Bucket.

illustration). An overhaul cable is a new addition to these sizes to give added digging power and assure rapid loading in hard-packed earth or gravel. An outside belt channel provides body reinforcement. The digging section of the bucket consists of an inside wearing blade, outside wearing plates and a body extension plate. Each bucket is equipped with manganese steel runner shoes at its front corners and with eight to twelve manganese steel teeth.

Speed-O-Matic Power-Controlled Shovels, Cranes, Etc.

In July, 1936, Link-Belt Company, Chicago, announced a power control, with short, easy-throw levers, to be known as "Speed-O-Matic Control," for application to power-operated shovels, draglines and cranes. Advantages are enumerated as (1) Elimination of Operator Fatigue; (2) Much Speedier Operation; (3) Greater Output.

In an analogy made by G. H. Olson, general manager of the company's shovel and crane division, the relative ease of operation of a Speed-O-Matic shovel-dragline-crane and the conventional machine with long, hard-throw levers, was compared to the drawing of water out of a faucet by simply turning a handle, and the hand pumping of water out of a pump. In the one case the operator merely controls the flow of the water; in the other instance he actually pumps it up by his own effort. Drawing water out of a faucet requires only an easy wrist motion, as does Speed-O-Matic control; whereas pumping water by hand requires a tiring arm and shoulder motion, as does the operation of the conventional mechanical lever control system. As the arm tires, the speed and volume of work decrease. In other words, a small fraction of the power of the machine is harnessed for doing the work under the guidance of the operator, instead of requiring his doing manual labor in performing the necessary operations thousands of times a day.

Link-Belt Crawler Shovel with Speed-O-Matic Control.

Speed-O-Matic control is now furnished as standard equipment on Link-Belt shovel-dragline-crane models K-40, K-45, K-48 and K-480.

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Byers 1937 Shovel

Increased speed features its Model "62" ½ yard shovel for 1937, according to The Byers Machine Co., Ravenna, O.

To attain speed Byers' 1937 model incorporates the use of roller bearings in order that the swing shaft, hoist and crowd shafts, also the swing, crowd-travel clutches will operate with a minimum of friction. The shovel is Timkenized with 32 roller bearings and has a moulded friction clutch lining. All the hoisting, swinging, crowding, traveling and steering operations are performed through three main assemblies and one shaft assembly in the lower deck.

The bucket trip is operated by power, controls are now directly in front of the operator so that he can perform all necessary operations without arising from his seat.

Among other noteworthy features of this year's model is an independent cable or chain crowd which makes it unnecessary to take off or put on additional machinery except split chain drum sprocket when changing from the dragline to clamshell or shovel attachment, or, of course, vice versa.

The 1937 Model "62" has two travel speeds in both forward and reverse—low gear for 30 per cent grades and a high gear for speeds of up to 132 ft. per minute. The operator can steer either crawler from right to left, make a long turn or a sharp turn in high or low gear and while the shovel is traveling either forward or backward. The crawlers are prevented from rolling backward while working by being locked directly from the operator's seat.

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TRACTORS

Another New Diesel Fuel Model Announced by Allis-Chalmers

Of interest to crawler tractor users is the announcement made in December by Allis-Chalmers Manufacturing Co., Milwaukee, of the new Model "S-O" Controlled Ignition tractor which has been added to their line of road machinery. This unit is a low compression Diesel fuel tractor in the class between the 49 H.P. Model "K-O" and the 79 H.P. Model "L-O." Officials of the company state that it is an entirely new tractor in every detail and is in no sense a stepped-up version of other A-C models.

Allis-Chalmers Controlled Ignition Diesel Fuel Tractor.

In the new controlled ignition engines the Diesel fuel is injected into the cylinder by an injection pump just as in a high-compression Diesel engine, but this measured charge of fuel does not depend on compression for ignition. Instead, it is ignited by an electrical ignition system, thus giving complete control over the point of ignition and burning of the fuel regardless of engine wear, type of fuel or temperature. Controlled air-fuel ratio is also a feature, giving the best proportion of air and fuel for maximum efficiency under all operating conditions. Other features include a 6-speed transmission with a truck-type gear shift which permits changing of gears without stopping the tractor. Truck frames are completely equipped with anti-friction bearings and roller bearings are used in all truck rollers and front idlers. Ground pressure is reduced and stability and traction increased through the use of wide track shoes included as standard equipment. The "S-O" weighs 18,000 lb. and is suited to bulldozing 8-yd. scrapers, 10 and 12-ft. graders and 8 to 12-yd. wagons.

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Case Heavy-Duty 4-Speed Special

The Case Heavy-Duty Four-Speed Special tractor is designed expressly to handle the whole range of road maintenance and medium construction jobs, including snow removal and belt work. Flexibility is built into this tractor with 4 gear speeds plus a flat-torque engine giving ample power and great lugging ability from less than half to 20 per cent above rated speed, and unbroken working range from 1½ to 15 miles per hour. Maneuverability is also secured with a wheelbase of only 79 in. and a turning radius of 13 ft. A full load can be pulled easily on turns with individual rear wheel brakes making turning positive. Air-cushion traction is provided with oversize low-pressure pneumatic tires giving 400 sq. in. of supporting and gripping contact, equally effective on paving or in loose earth.

Case "LI" Tractor Equipped with Goodrich Rubber Tires Pulling Galion Multiple Blade Road Maintainer Near Alexandria, Ind., in Madison County

Brief Specifications.

Engine—Heavy duty, 4-cylinder, valve-in-head type. Bore 4-⅝ in., stroke 6 in. (403 cu. in. piston displacement).

Brake Horsepower—57 on gasoline; 52

on No. 1 furnace oil with engine equipped for oil burning. Engine speed 1,100 r.p.m.

Lubrication—Full pressure with gear type oil pump. Oil forced under pressure to main bearings, connecting rod bearings, camshaft bearings, rocker arms, and governor parts.

Speeds—Four forward speeds and one reverse; selective gear type transmission.

Special Equipment—To fit all types of work.

The Case Heavy Duty Tractor can be fitted with various plows, all specially designed to handle large amounts of snow at minimum cost.

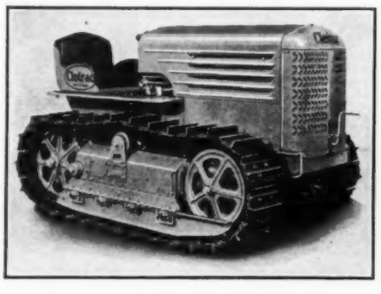
▼

New Cletrac Streamlined Crawler Tractors

Giving new grace and beauty to mobile power units that have until now been built for endurance rather than eye appeal, for utility more than style, the new streamline design of the crawler tractors for the Cleveland Tractor Co., Cleveland, O., eliminates sharp corners and projections and puts Cletracs in a new style class.

Comfort for the operator is provided in coil-spring cushioned seat, adjustable foot rests and controls that are stated to make Cletrac operation as easy as driving a team. Exhaust and intake are hidden from view.

The Cletrac patented features such as controlled differential steering, one piece



Cletrac Streamlined Crawler.

drop-forged shoe, track support and lubrication design and the frame construction are the same as before. The Cletrac line includes crawler tractors from 22 to 49 drawbar horsepower, powered with internal combustion and Diesel engines.

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TRUCKS, TRAILERS, AND TRUCK EQUIPMENT

Hug 12-Yd. Hauling Unit

The Hug Co., Highland, Ill., announced a new Model 95 6-wheel Hug lugger. In designing the Model 95 lugger, Hug engineers combined the chassis, body and hoist into an integral 12-yd. hauling unit, by covering two rear driving axles, ordinarily used under a 6-yd. truck, into a front and rear axle drive, and adding a 6-ton trailer axle as a center axle. Sufficient carrying capacity has been built into this truck to justify the installation of a Caterpillar Diesel engine.

Both front and rear axles are driving axles and are of the double reduction, full floating type, with high traction differential. For large tires of 18-in. cross section by 61-in. outside diameter and two smaller tires of 12-in. cross section and 48-in. outside diameter give a total ground contact of 2,400 sq. in., assuring positive traction.

A unique Hug principle in design is the addition of the center steering axle. This axle, mounted between the driving axles, serves not only as a load carrying member, but by steering in tandem with the front driving axle combines great load carrying capacity with exceptionally short turning radius. Both front and center axle steering is air actuated for ease of handling.

The Model 95 Hug lugger is available with the new 12-yd. Hug "scoop end" body, rigidly reinforced with "U" shaped "I" beam steel ribs. It is also equipped with a 12-yd. specially designed Le Tourneau "slide-out" body. The latter type of body eliminates the use of a power hoist, the four sides of the body sliding back off the bed, forcing the load to travel with it and leaving an ever widening opening until the body has reached the extreme rear position.

Proper load distribution and location of axles, together with the Caterpillar Diesel installation, give this Hug lugger unit the same flexibility and ease of handling as the smaller 5 and 6-yd. Hug roadbuilders.

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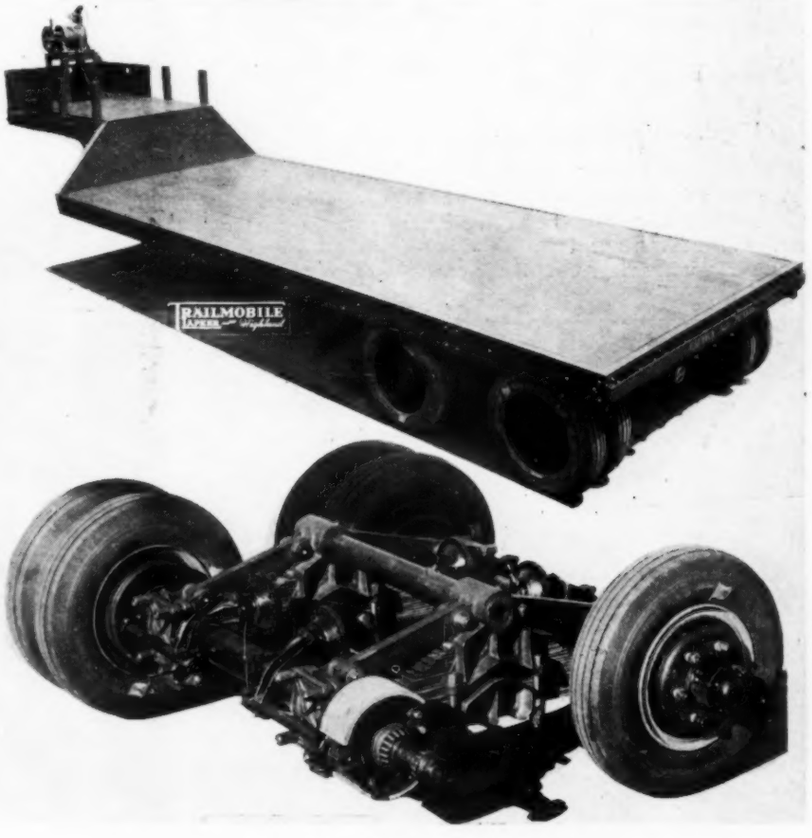
Heavy Trailer

The upper view shows one of 36 Trailmobile heavy road drags made recently for the United States Government by the Trailer Company of America, 31st and Robertson Aves., Oakley, Cincinnati, Ohio



New Heavy Duty Trailmobile.

Trailer platform is 8 ft. wide and 20 ft. long behind the drop. Small platform over interchangeable king pin supports loading winch with steel cable—also flood light for night operations. These trailers are used by the Department of Agriculture for hauling heavy tractors and other machines used in soil conservation between distant operations. They are also adaptable to military use for transporting light tanks, gun mounts and heavy military arms.

The lower view shows type of tandem axle and spring suspension which is mounted under frame with removable clips. Entire suspension can be removed for repairs.

Allis-Chalmers Hauling Unit

The Allis-Chalmers Speed Ace hauling unit is designed especially for high-speed operation. Both the trailer and tractor are mounted on pneumatic tires which give a large area of ground contact and provide smooth, easy riding under all conditions. The trailer has a bottom dump, controlled hydraulically from the tractor seat providing for instant dumping at the touch of the operator's hand. Capacity, 7 yds. The trailer is coupled to the tractor by means of a high arch at a point below and ahead of the rear axle center. The tractor is powered with a 4-cylinder engine the same as used in the Allis-Chalmers Model "K" tractor. Steering is assisted by independent clutches and the high arched hitch enables the tractor to undercut the trailer, enabling the unit to make turns of 90° angles and greater. High ground clearance of the unit eliminates "hang up" on the dump and permits quick unloading without "choking." One man operates the entire unit from the tractor seat.

The Speed Ace.

▼

New 18-yd. Capacity Rubber-Wheeled Wagon

A new rubber-wheeled wagon, which has been out on test work for the past year, will be announced by La Plant-Choate Manufacturing Co., Cedar Rapids, Ia., at the A. R. B. A. New Orleans highway exhibit.

This wagon has a capacity of 18 full yards of loose material, and is designed for use behind a "Caterpillar" RD-8 tractor. It is of the bottom dump type, and is equipped with hydraulic door-winding mechanisms, which are operated from the tractor seat by the tractor-operator.

The wagon has large dual wheels on the rear, and singles in front. It is also equipped with hydraulic brakes to prevent jackknifing when going over excessive slopes.

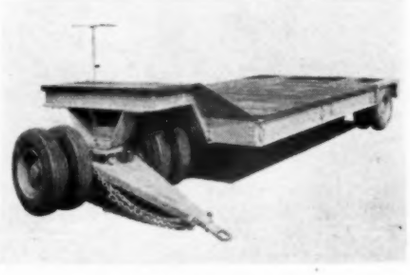
New La Plant-Choate Rubber-Wheeled Wagon.

Two Heavy-Duty La Crosse Machinery Trailers

The C. R. Jahn Co., La Crosse, Wis., announced two additions to their line of La Crosse machinery trailers for transporting shovels, tractors, road-rollers, and other contracting equipment. One is a 4-wheel trailer designed for loads up to 12 tons, and the other, with six wheels, is designed for loads up to 18 tons. In both the new models, the main beams extend the full length of the trailer and are shaped without cutting top or bottom flanges at the front deck. The front deck is raised to clear the front wheels to permit a full right angle turn of the front axle. The frame is further strengthened by tie plates at each of the numerous cross members.

The 4-wheel trailer has a rigid mounted rear axle; while the 6-wheel type has two independent oscillating type axles that are so arranged that the four wheels adjust themselves to the irregularities of the road. With this construction, each wheel carries its share of the load at all times.

Both models feature the oscillating front axle, another of the exclusive developments in La Crosse trailers. This arrangement eliminates the necessity of front springs and provides a greater flexibility and ease in turning.



New Jahn Co. Trailer

The brakes are of the mechanical, internal expanding type and are available for vacuum or air operation.

Over-sized taper roller bearings are used throughout. The loading height of each trailer is only 29 ins.

The trailer width of 8 ft. conforms with the highway regulations of all states. Solid or pneumatic tires are furnished on specification.

▼

Hug Truck

The Hug Co., Highland, Ill., has announced their new Model 30 Hug Lugger with "Show Down" Caterpillar diesel engine. Using low cost diesel fuels, unusually economical operation is claimed for this new hauling unit. The engine is the Caterpillar D8800 diesel, 4-cycle, water cooled, with a displacement of 831 cu. in. and A. M. A. rating of 52.9. Transmission provides 12 speeds forward and three reverse. The Hug setback wheel design allows exceptionally short turning radius and ease of handling. Many innovations in design and construction are incorporated in the chassis of the new Hug Lugger. The entire Model 30 Hug Lugger frame is electrically arc

welded. Trusses, spring hangers, motor hangers, radius rod braces and box section cross members are all electrically arc welded to the side rails, forming one rigid structure.

The body is the Hug "Scoop End" body with direct reversible high dumping angle hoist. There is no tail gate and the body sides are reinforced with "I" beam steel ribs. Body is of 10-yd. capacity and the maximum pay load of the unit is 30,000 lb.

▼

Combination Truck, Tractor and Dump Wagon Trailer

A new combination truck tractor and trailer earth moving unit was placed on the market. The tractor is a 4-wheel drive—4-wheel steer job, powered with a 130 H.P. gasoline engine. Diesel engine optional. It has a speed up to 40 miles per hour. Air powered steering on all four wheels are claimed to enable the operator to make a complete U-turn within 30 ft. and the air powered steering feature also reduces the strain on the driver. There are air powered brakes on all four tractor wheels and electric brakes on the trailer wheels. The complete unit is equipped with large pneumatic rubber tires, 18 in. in width and 60 in. in diameter, which provide ample ground contact.

The trailer is of the bottom dump type with a capacity of 12 cu. yd. rounded

Oshkosh Earth Mover

load, 10 cu. yd. water level. It has a low wide hopper top for quick and convenient loading and a large bottom opening. The tractor driver operates the entire unit. The dumping and winding operations are hydraulically controlled from the tractor cab. The high arched gooseneck design provides ample clearances for the tractor to cut under for maximum mobility and the high arched rear axle is for maximum dumping clearance. As optional equipment an adjustable spreader plow may be had for attaching at the rear of the trailer for spreading the dirt as it is discharged from the body. The spreader fills in the ruts, thus improving the road bed.

The entire unit is manufactured and marketed by Oshkosh Motor Truck, Inc., and A. Streich & Bro. Co., Oshkosh, Wis.

▼

New Line of GMC Trucks

A complete new line of trucks, highly competitive in quality, appearance and price, has been announced for 1937 by the General Motors Truck and Coach Division of the Yellow Truck and Coach Manufacturing Co.

The company, for the first time in history, has introduced a new light, short wheelbase unit at an extremely low price. It is a 112-in. wheelbase truck, rated at ½-ton capacity. Continued in the 1937 line is the 126-in. wheelbase ½-ton unit which proved so popular during 1936.

Indicative of the trend towards cab-over-engine design is the fact that the

New GMC Truck.

company now has a complete line of COE models ranging in carrying capacity from 1½ to 12 tons.

All models in the GMC line have been improved and refined. New all-steel "helmet top" cabs—standard and de luxe —are available for every model.

In addition to a complete new series of trucks, the GMC line also includes a complete new group of trailers with such improvements as heavier frames; new cast steel support legs; wider, reinforced support wheels; straight shaft with folding type crank handle; heavier springs; rubber-bushed radius rods; larger spring brackets, spring pins and spring shackles; improved lower fifth wheel construction and many other refinements.

Le Tourneau Cradledump Buggy

The Cradledump Buggy, a new earth-moving carrier of 30-yd. capacity, built for use with large-size tractors, and without the front axle, for use with trucks as a semi-trailer, was announced by R. G. Le Tourneau, Inc., of Peoria, Ill., and Stockton, Calif. The Hug Model 100 tractor truck was developed to handle this Le Tourneau job. The combination of Cradledump trailer and tractor truck was specially designed by Le Tourneau and Hug for the use of contractors desiring a powerful, highspeed carrier for long hauls.

The Cradledump buggy has a water-level capacity of 30 cu. yd. and approximately 35 yd. loose measure. Its inside body dimensions are 9x13 ft. Unloading is controlled from the tractor driver's seat by means of ½ in. steel cables and sheaves connected to a standard two-drum power control unit mounted at the rear of the tractor motor. The body is pivoted at the top and expels its load by moving in a cradle-like arc to the side, forcing the entire load off the buggy as it moves. One line from the power control unit controls this dumping process, the other line returns the body to the loading position and holds it there.

Both the cradledump buggy and Hug Model 100 tractor truck are mounted on 18.00x24 tires, with six tires on the truck and four on the cradledump trailer. This gives a ground contact for the combination of 6,000 sq. in. When used with tractors the cradledump buggy is equipped with eight of these tires, mounted front and rear in dual sets.

The Hug Model 100 tractor truck is built especially for use with the Cradledump buggy, has a 4-wheel drive and is powered by a Caterpillar Diesel Model D13000 engine.

▼

New Heavy Duty Trailer

A new trailer believed to be the largest ever equipped with pneumatic tires was shipped by the Rogers Brothers' Corp., Albion, Pa., to a customer in Los Angeles, Calif. It is stated the trailer will carry a payload of 75 tons. The rear gears under the trailer consist of 8 wheels on 4 rocking axles, each wheel equipped with 9.75-15 in. 12-ply tires. The front gears is a small semi-trailer dolly with 4 wheels rear on 2 rocking axles, each wheel equipped with one 13.50-24 in. 16-ply tire.

The deck of the trailer is 11 ft. 6 in. wide, 18 ft. long from the back of the gooseneck to the front of the rear wheels.

New Heavy Duty Trailer

Loading height at the rear of the trailer 35 in., loading height at deck 29 in. These height measurements are without load. Tires will deflect 1 in. or 1¼ in. under fill load. The overall length of the trailer as a semi is 36 ft. 6 in. and as a complete trailer with dolly 47 ft. 9 in.

St. Paul Hoist for Dump Bodies

A new direct lift, double-acting hoist for 1½ to 20-ton trucks, that provides a 77 degree dumping angle, was brought out by the St. Paul Hydraulic Hoist Co., St. Paul, Minn. The hoist is a heavy duty type with a full 6 in. cylinder bore and massive hinge construction, with heavily reinforced frame.

After a loaded body reaches a 50 degree dumping angle, the center of gravity of the load passes beyond the center of the hinge. The hoist is equipped with a hydraulic check, which cushions the load to the extreme dumping angle, controlling the speed of the body throughout the entire dumping operation, thus eliminating shock to the hoist and chassis frame.

No springs or chains are necessary to return the body to normal position. By placing the valve in the lowering position and engaging the power take-off, the body will be brought back by hydraulic power. For quick action, the body may be lowered the entire distance by power, or merely brought back past the center of gravity from which point it will return by gravity.

With the new hoist, the body can be locked in any position even after passing the center of gravity. The pump may be left in operation when spreading a load, and the body may be raised, lowered, or locked at will. The control valve on the hoist provides positive control at all times.

▼

ENGINES AND MAGNETOS

New Magneto

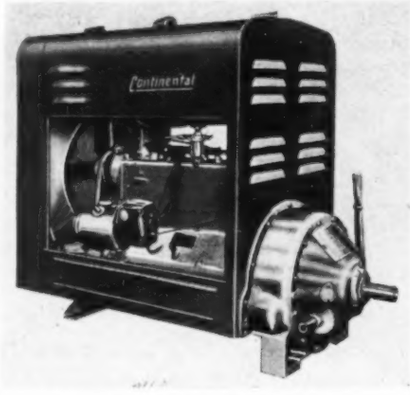
A new type of magneto specially designed for light and medium size gasoline engines as used in road work will be shown by Scintilla Magneto Co., Inc.,

New Magnets for Light and Medium Sized Gasoline Engines

Sidney, N. Y., at the ARBA Highway Exhibit. These magnetos, known as the PC series, are popular priced and weigh only approximately 9 lbs. High electrical output is obtained by a rotor magnetic made of a new magnet alloy which is more powerful than any magnetic material hitherto available. Other features are pivotless breaker, moisture-proof coil, ball bearings on both magnet and shafts, complete enclosure of operating parts and impulse coupling.

Two New Power Units by Continental Motors

Pictured below is power unit PF 218, recently developed by Continental Motors Corporation, Detroit. This unit has six 3¼ in. cylinders with 4⅜ in. stroke, 25.4 horsepower, S.A.E. rating. The



Continental Power Unit PF 218.

specification bulletin issued by the company includes performance chart, general description and diagrams.

The other new unit is the PY 21, in which four 2⅞ in. cylinders develop 13.23 S.A.E. rated horsepower. The specification bulletin is similar in character to the PF 218 bulletin.

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Series "AP" Wico Magneto

In order to meet the pace set by modern engines with increased speeds and higher compressions, the Wico Electric Co., Springfield, Mass., brought out the highly developed series "AP" magneto. In it are incorporated the simplicity and compactness to be obtained by taking advantage of the most modern materials and methods. The magneto can be reduced to its component parts and reassembled in a few minutes by an ordinary workman using an adjustable wrench and a screw-driver. Complete with impulse coupling it weights only 7½ lb.

Type "AP" Wico Magneto.

Precision needle bearings are used in the series "AP" magneto and are kept plentifully supplied with clean oil by the Wico circulating oil lubrication system. The effectiveness of these bearings and their lubrication is largely responsible for the ability of these magnetos to operate at speeds of as high as 7,000 R.P.M. continuously. The light oil lubricant used insures the freedom of flight of the magneto armature which guarantees a hot spark every time the engine is started in cold temperatures.

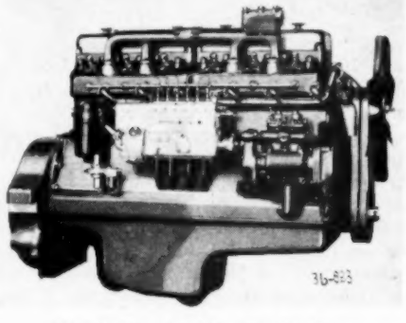
In order to meet the requirements of the individual engine the series "AP" Wico magneto is made with two values of intensity and volume of spark output. For engines below 6½:1 compression ratio the standard "AP" is recommended. Engines with higher compression than this ordinarly use the Heavy Duty series "AP."

▼

New Diesel Engines

More power and greater economy are claimed for the new Waukesha-Ricardo Comet diesel engines just announced by the Waukesha Motor Co., Waukesha, Wis. Superseding the current models and available after the first of the year will be their new series known as the Mark III Comets which will comprise for the present but two sizes, a small six of 462 cu. in. and said to develop 110 H.P. at 2,000 r.p.m., and a large six of 648 cu. in. developing 150 H.P. at the same speed. These two engines are in reality the refinement by another year's research work of the two current models of the same size. Both engines are similar in major respects differing chiefly in details of construction.

The Model 6D-140-648, the 150 H.P. engine, shown in the illustration, is designed for heavy duty long distance high speed truck and bus operation where exceptional power and stamina are required. It has a bore and stroke of 5x5½ in., a 4 in. seven-bearing hardened



Waukesha Model 6D Engine.

alloy steel crankshaft 25 per cent stiffer than its predecessor, and heavy wall steel backed silver-cadmium precision bearings. No shims are used in the main bearings, but in the connecting rod bearings which are steel backed thin wall lead-bronze bushings, laminated shims are used on one side for convenience in take-up.

The smaller engine, Model 6D-110-462, has a bore and stroke of 4⅜ in. x 5⅛-in., a 3⅝-in. seven-bearing hardened alloy steel crankshaft also running in steel

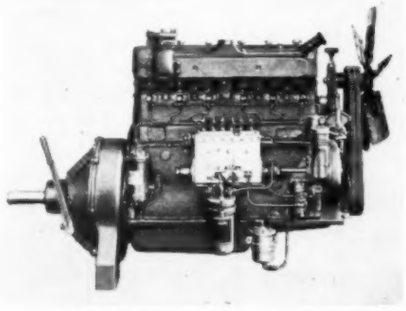
backed silver-cadmium precision bearings. No shims are used in the main bearing of this model, either, but in the connecting rod bearings, laminated shims are used on one side for taking up the thin wall lead-bronze bushings.

▼

Buda Produces New Diesels for Small Excavators

To meet the demand created by the rapidly growing use of ⅜, ½ and ⅝-yd. shovels, cranes and draglines, the Buda Company of Harvey, Ill., has in recent months developed two new Diesel engines. The improvements involve improved combustion, low maximum operating pressures, high workable mean effective pressures, excellent fuel economy, smoother running, reduced wear on reciprocating parts and bearings, and reduction in the compression ratio to a figure comparable with gasoline engine practice. These new Diesels are particularly adapted to shovel, crane and dragline service, having torque characteristics that meet the heavy drag-down loads, and stand up under conditions of operation where loads may fluctuate from no load to peak load in a few seconds' time.

P & H Model 150 *Bantamweight ½-Yd. Shovel, Powered with a Buda Diesel Model* 6-*LD*-275.



Buda 6-*LD*-468 *for Use on Power Shovels and Similar Equipment.*

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COMPRESSORS AND AIR TOOLS

Vertical-Angle Three- and Six-Cylinder Air-Cooled Compressors

Worthington Pump & Machinery Corporation, Harrison, N. J., announced its latest development in three- and six-cylinder vertical-angle two-stage compressors.

A line of compact, self-contained units with capacities ranging from 142 to 445 cu. ft. per minute has been developed. The three-cylinder has two low-pressure cylinders set opposite each other at an angle, with a high-pressure cylinder set vertically between them. The six-cylinder unit is set up in the same manner, with two cylinders side by side in each position. The units may be had with Worthington, Multi-V-Drive, direct-connected to the motor through a flexible coupling, or with the motor mounted directly on the end of the crankshaft. The compactness of this unit combined with the variety of drives available makes it easily adapted for installation.

Automotive type pistons with two compression rings, two oil rings, and full-floating wrist pins are used on all models Articulated connecting rods permit the use of a large crank pin bearing and the same center line for all cylinders. A finned, radiator type intercooler, with a fan which draws air through the cooler and over the cylinder head, quickly removes the heat of compression. A large oil reservoir in the crankcase, force-feed lubrication, an oil cooler and an oil filter assure complete and efficient lubrication of all moving parts. The suction and discharge valves are in separate compartments, allowing removal without disturbing the pipe connections. The crankcase is fitted with large cover plates, providing speedy and easy inspection of the running gear.

Compressor Unit Utilizes Ford Engine

In a new air compressor unit placed on the market by Wenzel-Kenney Machinery Co., 229 Southwest Blvd., Kansas City, Mo., one side of a Ford V-8 engine operates as a motor while the other side is converted into an air compressor by a special valve and engine head arrangement.

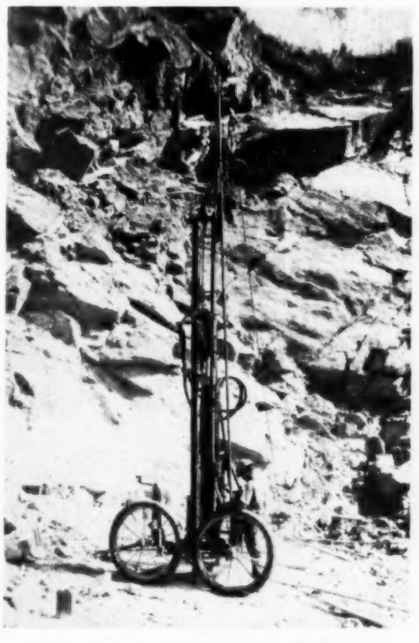
A special feature of the unit is the combination valves (intake and exhaust one inside the other) with the intake cooling the exhaust on the inside and a large water jacket in patented head cooling the exhaust on the outside. It is stated that it requires only a few minutes to take the valves out of the machine, as they are inside a cage that screws in from the top of the head.

Three models are made: A model Ford engine with two central cylinders compressing the air; Single V-8 with one bank making air and the other furnishing power; and the large Double V-8 with one V-8 engine furnishing the power connected to another V-8 with two Wenzel-Kenney compressor heads producing 104 cu. ft. of air.

▼

Two New Ingersoll-Rand Jackhamers

A new drill for a multitude of jobs is the "JA-30 Jackhamer," recently introduced by Ingersoll-Rand Company of Phillipsburg, N. J. It is especially useful in light rock drilling, such as blockholing, trimming, scaling, holes for conduits, pipes, railings, foundation bolts, maintenance and demolition work. It is stated that the new Jackhamer is a very fast driller and uses but a small amount of air. I-R Bulletin No. 2254 shows the "JA-30" jackhamer and gives a number of views of the drill in operation on representative jobs.



New Ingersoll-Rand Jackhamer.

Another new Ingersoll-Rand jackham-

er with which, it is claimed, users can get up to a third more drilling from their present compressor equipment, is the "JA-45." For example, if a portable compressor is now operating two 55-lb. drills, three of the new "JA-45" jackhamers can be substituted, it is said, resulting in an increase of one-third in drilling. The "JA-45" weighs about 45 pounds and is about 21 inches in length. It is available in dry, wet, and blower styles, and is described in Bulletin No. 2266.

▼

Electric-Driven, Two-Stage, Air-Cooled Portable Compressor

The two-stage, electric portable compressors described in Ingersoll-Rand Bulletin No. 2198 are the natural complement to a complete line of gasoline engine driven and oil engine driven two-stage portable compressors. The line of compressors is the same, but driven by either A.C. or D.C. motors. Starting equipment is of the magnetic type to operate from a push button. Five models, from 15 to 75 H.P., and numerous types of mountings, are available.

▼

Le Roi Truck Air Compressor

A new line of truck air compressors was announced by the Le Roi Co., Milwaukee, Wis. This company manufactures three sizes of compressors, 85, 105, 160 cu. ft. capacity, free air at 100 lb. pressure. The compressors can be operated from any current make or model truck by means of a split shaft power take-off used, which is manufactured by the Hercules Steel Products Co., Galion, O.

The 85 and 105 cu. ft. compressors can be operated from any 1½-ton truck.

Le Roi Truck Air Compressor

The 160 cu. ft. compressor requires a truck of 2½ to 4 ton capacity.

Le Roi designed the complete line especially for truck motor operations, accounting for the difference in operation of truck jobs, as compared to the standard portable type compressors. Perfect balance has been accomplished between the compressor and the truck motor, which is claimed to assure the purchaser of a completely engineered truck air unit. Some models required only 29 in. space back of cab. Special construction makes it unnecessary to cover the compressor for weather protection. Special belt tightening arrangements exclusively used by Le Roi. Special bodies can be secured from the Le Roi Co. to be used in connection with the compressor mountings.

New Type Air Hose

Hipress air hose, a new product designed for all types of air tool applications, was announced by the B. F. Goodrich Co., Akron, O.

This hose is unique in that it is a combination construction made in long lengths. The inner carcass consists of four plies of specially woven duck. The outer carcass is a tight braid of high ten-

New Type Air Hose Features Combination Construction

sile cords which are applied with a tension ten times that normally used on long length braided hose. Between the inner and outer carcass is a substantial insulation which serves as a secondary tube to seal off penetration of air through the walls of the hose and to cushion blows from the outside.

The wrapped construction of the inner carcass provides an ideal backing for the tube due to the fine weave of the fabric. This is particularly valuable when tube is subjected to softening from internal heat. Due to the bias design of the wrapped fabric, any air or fluid which reaches it travels only a short distance before reaching terminal point of the yarn, thus preventing penetration throughout entire length of hose. However, the use of an outer braided carcass gives greater flexibility and more secure adhesion of cover than is obtainable with an all-wrapped construction.

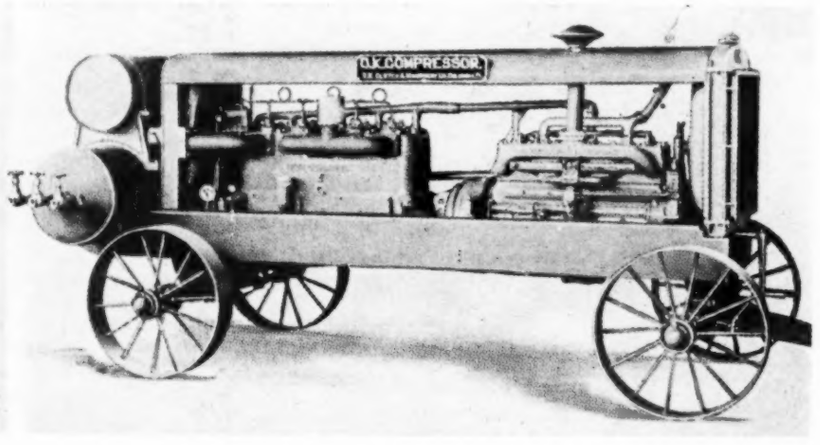
The tube is made of a special rubber capable of resisting both oil and heat. Not only is it claimed that this tube will last longer in air hose service where oil is present but that it will not break into loose particles and clog the tools. The rubber cover of hose is compounded to withstand abrasion and abuse.

Hipress air hose is furnished in three sizes, ½ in., ¾ in. and 1 in., and will be made in 500 ft. lengths.

▼

O.K. Clutch Introduces Two New Compressors

During the past year the O. K. Clutch and Machinery Co., Columbia, Pa., added both 2-stage and single stage portable compressors to its line. The 2-stage model is supplied in capacities of 160 and 210 cu. ft. of free air per minute at 100 lbs. pressure, and with either gasoline or full Diesel power. Mountings are on either steel or rubber tired wheels. The manufacturer's catalog emphasizes the following 12 points:



Two-Stage O.K. Compressor—Type TS 160.

1. Heavy duty type six cylinder engine.
2. Heavy duty type radiator solid core or sections with guard.
3. Auto-pneumatic throttle to idle engine when compressor unloads.
4. Air cleaners both engine and compressor.
5. Self-aligning and adjusting trouble free clutch coupling (asbestos discs).
6. One solid piece electric welded engine and compressor frame.
7. Straight line water cooled compressor.
8. Large hand holes for easy accessibility to crankshaft and connecting rod bearing.
9. Simplified free air unloader.
10. A.S.M.E. air receiver and lead washed gasoline tank.
11. Heavy wide faced steel wheels.
12. Extra heavy steel axles and drawbar.

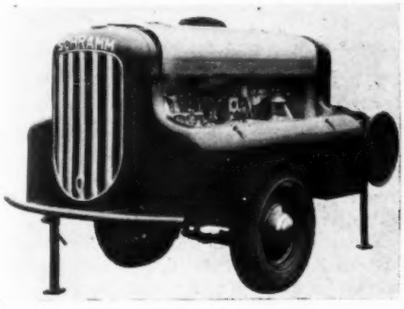
The new single stage compressor has a capacity of 210 cu. ft. of free air per minute at 100 lb. pressure. It also is provided with either gasoline or Diesel engine and with either steel or rubber tired wheels. The gasoline-powered unit on steel wheel mounting is 11 ft. 8 in. long, 6 ft. 0 in. wide, 5 ft. 10 in. high, and weighs approximately 5,200 lb. With Diesel power and steel wheels the weight is 6,000 lb.

Six-cylinder Hercules engines are used on all units—either gasoline or Diesel. Operating speed of engine and compressor is 875 r.p.m. for all units.

New Schramm Compressor

A new compressor brought out by Schramm, Inc., West Chester, Pa., has a compressor capacity of 105 cmf. of actual delivery at 100-lb. pressure. The driving unit is one Ford V-8 engine. The compressor is a second duplicate engine that has been converted by the company.

The compressor end delivers to an air receiver located over the compressor under the hood of the assembly. Located between the two units at one side is a control panel including provision for self-



New Schramm "Ford-Air" Compressor

starting and speed regulation to match the demand for air. At the engine end is a protected radiator and under the hood at the compressor end is a fuel tank of 16-gal. capacity. On the two-wheel trailer arrangement are two hose reels connected to delivery from the air receiver, opened and closed by valves at the center of each reel. There is capacity on each reel for 100 ft. of air hose.

The compressor housing is made of 16-gage steel with drop leaf doors to provide access to either side. The engine and compressor are supplied with air intake cleaners. Mounting of the unit is on leaf springs on pneumatic tires. In addition to the trailer mounting, the unit is available on skids and in arrangement for installation on a motor truck.

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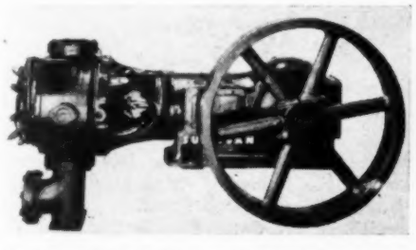
Sullivan's Machinery's New Stationary Compressor

A completely new design of stationary compressor designated as the WG-8 was introduced during 1936 by the Sulli-



Sullivan W-G8 Heavy Duty Compressor.

van Machinery Company, 307 N. Michigan Ave., Chicago.

This compressor is a heavy duty machine of the single stage double acting horizontal type available for any kind of drive and particularly suitable for the quarry and shop. The WG-8 is available in sizes from 10 to 50 horsepower.

Particular attention has been given the design to provide a unit which would require a minimum of attendance and could be serviced when necessary by the average mechanic.

Features which have been incorporated into this design to provide this simplicity are a cylinder liner which is readily replaceable in the field, a crosshead which requires no adjustment, a removable crosshead guide easily replaceable, connecting rod bearings of the interchangeable thin shell automotive type and the use of Timken tapered double row main bearings.

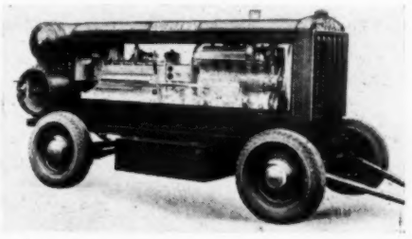
▼

New Air Compressor

Schramm, Inc., West Chester, Pa., announced a complete line of air compressors with new features of design and operation.

The general design is one that utilizes a new engine speed for compressor operation. By using smaller and lighter pistons and operating at an increased speed in keeping with the modern trend of automotive design, considerable weight savings are secured.

Compressor features include a new type of mechanical intake valve located in the compressor block and operating from the camshaft in perfect timing with piston travel. Main bearings intersperse every cylinder so that four cylinder models have



Schramm "Utility" Compressor

five bearings and six cylinder models have seven bearings. Forced-feed lubrication is pumped under pressure to all main and connecting rod bearings, assuring positive and thorough lubrication and a guarantee of long life.

The compressors are of the vertical, straightline construction with cylinders cast en-bloc. Between the compressor and engine units a clutch coupling is provided that allows compressor to be disengaged when starting the engine.

Gasoline powered sizes are offered with air deliveries of 85, 105, 160, 210 and 315 cu. ft. per minute. Diesel powered sized include the 105, 160, 210, 315 and 240 cu. ft. ratings. A complete assortment of running gear types are offered in all of the sizes.

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CRUSHERS AND GRAVEL PLANTS

New Dual Crushing, Screening and Loading Plant

The new Universal dual gravel crushing, screening and loading plant illustrated is a modern development of the Uni-

New Universal Dual Plant

versal Crusher Co. of Cedar Rapids, Iowa.

The manufacturer claims high efficiency and low cost operation for this compact plant which employs the following Standard Universal Equipments: a No. 936 jaw crusher, a 30 in. x 16-in. roll crusher, a 4-ft. x 8-ft. double deck gyrating screen, and a sand rejector. The entire assembly is mounted on a heavy duty gooseneck type 6-wheeled truck with twelve pneumatic tires. A 52-ft. x 24-in. feeder belt conveyor; a 52-ft. x 18-in. delivery belt conveyor, and a 21-yd. steel jackleg bin complete the assembly.

Universal portable plants of this type are made for handling 100 to 200 tons per hour and over; other Universal plants in models to suit varying operating conditions being available in both portable and stationary types.

Crushing and Screening Plant

A crushing and screening plant having the rotor-lift, a patented arrangement, by which the use of bucket elevators or long return conveyors is eliminated, was brought out by the Diamond Iron Works, Inc., Minneapolis, Minn.

Rotor-Lift Plant in Operation.

The plant proper is equipped with a 10-in. x 36-in. roller bearing jaw crusher, a 30-in. x 20-in. roller bearing roll crusher, and a 4-ft. x 8-ft., 2½ deck vibrator screen.

All of the bearings are of the anti-friction type, so that a very nominal amount of horsepower is required to operate the plant.

Another feature in this plant is the vibrating screen, which is completely suspended in rubber in shear so that absolutely no vibration from the screen is transmitted to the plant proper.

Despite the fact that the plant is equipped with an unusually large jaw crusher, and a larger than ordinary vibrator screen, as well as 24-in. conveyors, due to the improved design and the material used, the total weight of the plant for transportation purposes is 50,000 lb. Being mounted on pneumatic tires, it is very easily transported.

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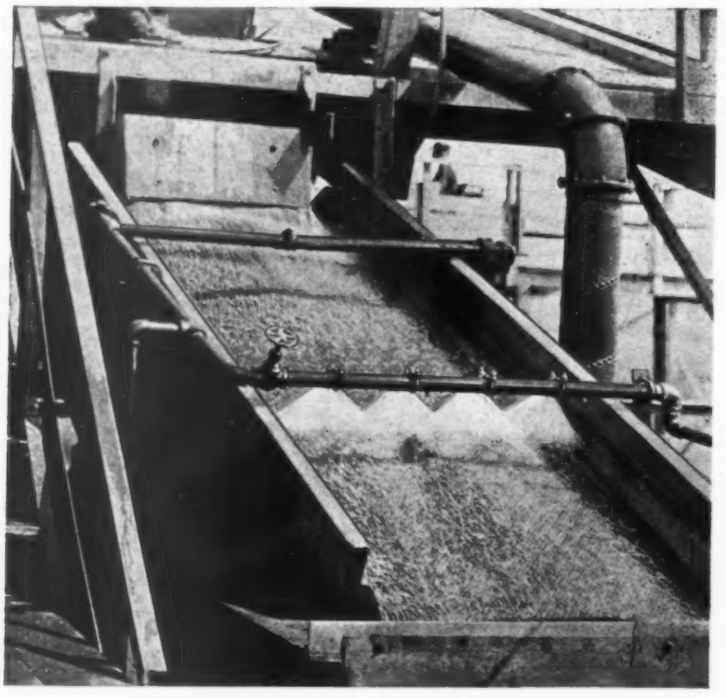
Non-Clogging Spray Nozzle for Sand and Gravel Plants

Announcement is made by Link-Belt Company, 300 W. Pershing Rd., Chicago, that it has developed a simple, effective, non-clogging spray nozzle for spraying, washing and cleaning all kinds of materials, screens, etc. In the road field it finds a special application on the vibrating screens of sand and gravel washing plants.

The new nozzle is described as a scientifically shaped, smoothly polished curved bronze deflector with U-bolt for clamping the deflector securely to water pipe, in such a position that it is just above the orifice (a plain drilled hole) in wall of pipe. The width of a deflector permits a comparatively large water jet, and thus allows fairly large dirt particles to pass through the orifice without clogging it. To assemble the deflector on pipe, it is only necessary to place it in proper position over the orifice, and then tighten the hex nuts on the U-bolt.

A new four-page illustrated Folder No. 1407 describes the nozzle, and gives capacities in gallons of water per minute for the different diameters of orifices at various water pressures.



Link Belt's New Spray Nozzle.

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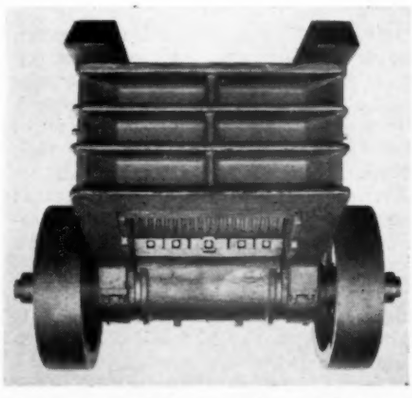
Roller Bearing Crushers

The Iowa Manufacturing Co. of Cedar Rapids, Ia., is now marketing a complete line of SKF bearing equipped force feed type jaw crushers in addition to their complete line of plain bearing jaw crushers and roller bearing and plain bearing roll crushers.

These new Cedar Rapids roller bearing crushers, it is stated, are constructed so that field lubrication for the bearings is required only every six months. The bearings are sealed in a new and unusual manner so that they are at all times fully protected from dirt and dust.



Heavy Duty S.K.F. Equipment Primary Crusher

Crusher bases and pitmans are electric cast steel, shear pins and toggle plates provide the safety features, crushing chamber is completely lined with manganese, and flywheels are counter balanced.

Cedar Rapids roller bearing crushers are available in the following sizes: 10 in. x 20 in., 10 in. x 24 in., 10 in. x 36 in., 15 in. x 24 and 15 in. x 36 in.

▼

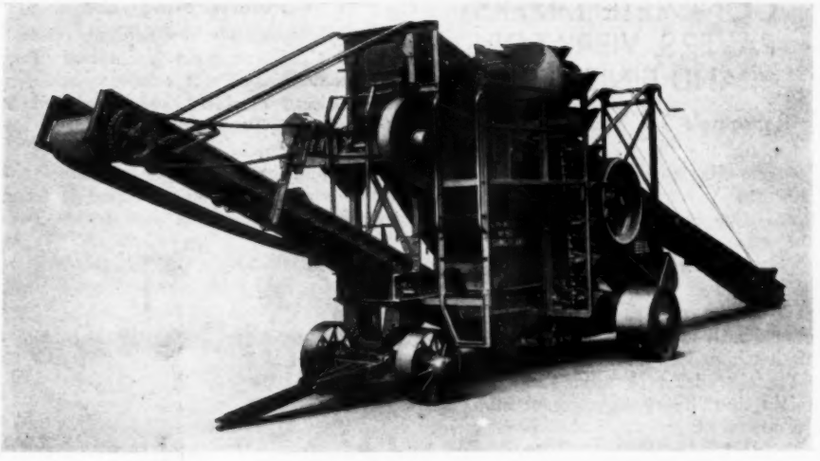
Lima Locomotive Changes Location Seattle and San Francisco Offices

The Lima Locomotive Works, Incorporated, Shovel and Crane Division, announces the following changes in location of their Seattle, Wash., office and their San Francisco, Calif., office. The Seattle office, which was formerly located at 2244 First Ave. South, has been moved to 1932 First Ave. South. The San Francisco office, heretofore located at 26-32 Fremont St., is now located at 200 Bush St.

Austin-Western Portable Crushing Plants

The success of the No. 100 portable crushing and screening plant of the Austin-Western Manufacturing Co., Aurora, Ill., created a demand for smaller plants built to the same high standards. To meet this demand Austin-Western has developed the new No. 70 and No. 80 plants. These plants are completely self-contained, and are readily portable, but are fitted with but one crusher instead of the two crushers used in the No. 100 Plant.

To meet less exacting demands where screening is not required, Austin-Western has developed a varied line of C.E.P. (crusher, elevator, and power) portable plants. These plants are especially adapted to conditions requiring frequent moves.



No. 80 Portable

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Haiss Loader at Work

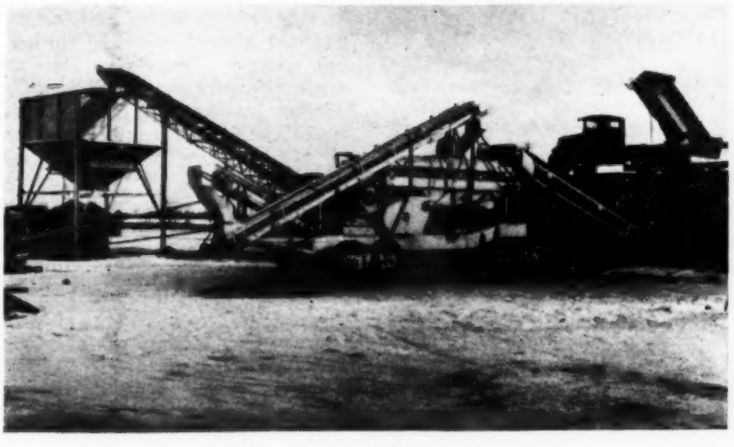
New Truck Loader

The picture shows the latest development in truck loaders manufactured by George Haiss Company of New York City. This machine is known as the Model 135, has a loading capacity of 5 to 8 yds. per minute. The caterpillar mounting on 16-in. cats equipped with floating pins driven by a combination manganese sprocket and pinion. It is steered through the differential in the transmission box. The buckets on this loader are 36 in. long and 12 in. wide, mounted on two strands of manganese chain, having a tensile strength of over 60,000 lb. each. These run on manganese sprockets, two mounted on the head shaft and two mounted on the tail shaft. The head shaft is equipped with a lugging type overload release which will slip should the load be excessive. These loaders are equipped with a variety of spouts and can be driven with either a 65-H.P. gasoline engine or electric motors.

▼

Crushing and Screening Plant

A plant which embodies their new roller bearing crusher as a primary, the roller bearing roll crusher as the secondary crusher, and the Iowa Symons vibrator screen as the screening unit was brought out by the Iowa Manufacturing Co., Cedar Rapids, Ia. This plant is completely roller bearing throughout; mounted on either solid, or pneumatic tires; equipped with gas or diesel power; and with straight or swivel type feed conveyor. It has all of the very latest attachments and units. In addition to the Super Models, Iowa announces a complete line of Junior tandem models for 1937.



Iowa Super Tandem Plant

CONCRETE MIXERS, PAVERS, VIBRATORS AND FINISHERS

Ransome's 7-S and 10-S Mixers

Among the developments of Ransome Concrete Machinery Co., Dunellen, N. J., were the two-wheeled, trailer type, end discharge concrete mixers in the 7-S and 10-S sizes.

These trailer type mixers are typically "Ransome" in design, quality and workmanship, the same as the pavers and larger mixers built in various sizes up to 4½ cu. yd. batch capacity.

These trailer type mixers are of lightweight but heavy-duty construction and are arranged on shock-absorbing springs with steel or rubber tired truck wheels equipped with roller bearings. Mixers are compact and well balanced for towing and easy manoeuvring on job, permitting mixers to be located in limited spaces.

Other features and refinements in these mixers are: positive water control with non-by-passing water valve; all steel drum with drum shell and mixing blades of high carbon wear resisting steel; solid steel roller tracks welded to drum and machined to true diameter; discharge chute also of high carbon wear resisting steel; each roller equipped with two Timken tapered bearings; speedy power loader skip of streamline design that elevates to a 50-degree angle, dumping its load into the drum fast and clean without any pounding; countershaft revolving in Hyatt bearings in self-aligning boxes. Operating levers arranged at one end for easy one-man control.

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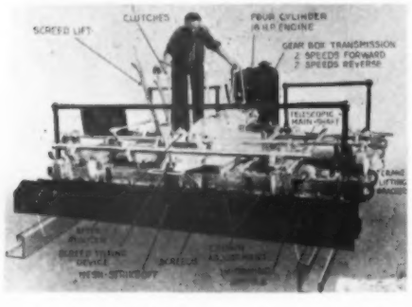
New Flexible Finishing Machine

In 1936 the Flexible Road Joint Machine Company, Warren, Ohio, introduced the new Panama type Flex-plane finishing machine, which is equipped with



Flexible Finishing Machine, Type R.

backward screeding, special widening device to widen the machine from 18 to 30 feet—full width construction; special track wheel attachments for the machine to be used on widened curves to eliminate setting the third form as is the usual practice; the forms are set to the extreme width of the road and the machine automatically follows the forms; built-in gear box, two speeds forward and two reverse; lifting device for placing the machine on the transportation wheels and transportation device.

Vibratory Paving Tube

A vibratory tube applied to concrete paving slabs, for applying internal vibration, which may be attached to any type of finishing machine, was developed by the Electric Tamper & Equipment Co., Ludington, Mich.

The unit consists of a 4-in. steel pipe which spans the width of the pavement to within 3 in. of the side forms, upon

Jackson Vibratory Paving Tube

this pipe at its center is mounted a powerful electric vibratory motor which is powered by a portable gas-electric generating unit mounted upon the finishing machine. The tube is raised and lowered by operating lever conveniently located.

It is stated that with the use of this machine it is possible to easily handle 1-in. slump concrete and leave a plastic material for the finishing machine to strike off and for subsequent surfacing operations. Another desirable feature of the machine lies in its ability to thoroughly puddle adjacent to the transverse joints and side forms without the use of additional puddling devices or labor.

▼

Jaeger Mixers

Faster charging and discharge speeds; smoother operation due to machined steel drum tracks with ball bearing rollers and an average of 25 per cent more engine power; plus modern, compact, streamlined designs, including 2-wheel pneumatic tire mounting for 3½S, 7S and 10S mixers, were features announced by the Jaeger Machine Co., in its 1936 line of concrete mixers.

For bridge building, curb and gutter and general construction work, the manufacturer stretted the advantages of its 2-wheel 10S and 7S Speed King models, because of their end discharge design and ease of hauling and of placing on the job. Heavy 6- and 8-ply industrial pneumatic tires are used. Pneumatics, with Timken bearing axle, make it possible to trail these Speed Kings behind light trucks at speeds up to 35 miles an hour, it is stated.

Streamlined tilting mixers offered in 3½S to 7S sizes, featuring the Jaeger patented "Dual Mix" drum with "V" bottom on all models, a pneumatic tired 3½S trailer, and a popular priced 5S size with 2-wheel trailer mounting and end discharge adapted for work in congested streets, backing up to cellar windows and foundations, and pouring with swinging spout.

Jaeger non-tilting units were being built in 7S to 56S sizes with machined steel drum track standard on all sizes. Skip shaker power loaders and gate-type shaker batch hoppers, with wider, special shape discharge chutes and "forced discharge" bucket action make possible higher speeds and increased production in spite of the dry, sticky mixes used today. To combat abrasive action of harsh concrete and lengthen life of the mixers, man-ten steel is used in renewable liners and at points of greatest wear.

In its 1- and 2-yd. plant mixers, the company stated that it had achieved the shortest, most compact design yet produced for advantageous set-up with operating speeds comparable to that of smaller Jaeger mixers.

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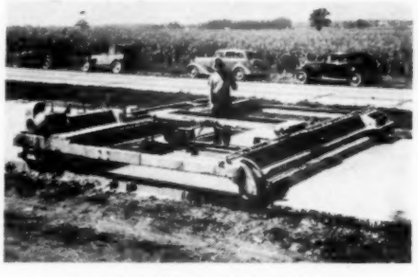
Koehring Longitudinal Finisher

An entirely new finishing machine was developed and introduced by Koehring Company of Milwaukee in 1936. It is designed for the final finishing of the slab of concrete highways, making possible, by the new mechanical method, an accurate finished surface. The finishing is accomplished by the longitudinal back and forth movement of a screed traveling



New Koehring Slab Finisher.

transversely and forward as it crosses the slab from form to form. The screed conforms exactly to specified crown, by means of an adjustable template track for the travel of rollers attached to the screed carriage. High spots are planed and low spots are filled, by a kneading action, without disturbing the consistency or texture of the concrete. A very slight angle to the screed assures the movement of excess concrete forward and away from the finished section.

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WEIGHING AND PROPORTIONING PLANTS

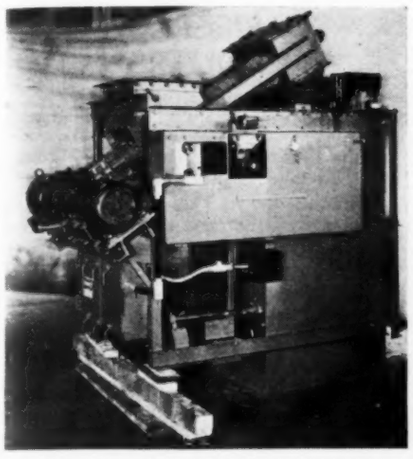
Improved Richardson Batching Scale

The automatic cement batching scale of the Richardson Scale Co., Clinton, N. J., was improved by the addition of a motorized discharge gate. This gate is of the undercut type with brush seal which effectively prevents any leaks and provides a quick, smooth discharge of all weighed cement.

Richardson cement batching scales of this type are used for weighing cement from overhead bins and discharging the predetermined amount into trucks or batch compartments in highway construction. They are also used for weighing

the cement in bulk at the mill, direct to railroad cars, barges or trucks.

Positive electric interlocks safeguard both the user or road contractor and the state against any inaccurate weights. The scale shows, by means of the over and under indicator, both the empty balance and the loaded balance at each cycle of operation. Unless the weighing is accurate, it cannot be discharged, and unless the scale is in true empty balance, it cannot be started. On the semi-automatic scale, an automatic ejector quickly removes any excess cement from the weigh hopper, the beam balances and the weighing can then be discharged.



Richardson Automatic Batching Scale

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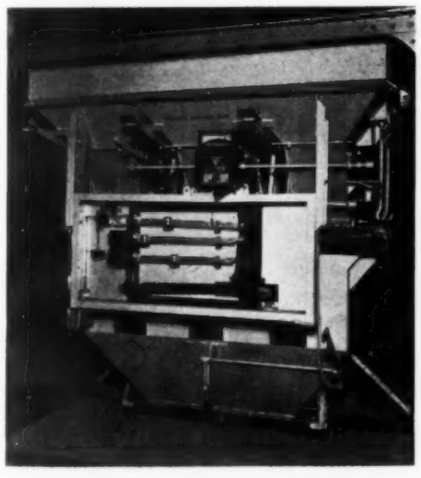
Blaw-Knox Semi-Automatic Weighing Batcher for Three Aggregates

In this 1 cu. yd. semi-automatic weighing batcher for three aggregates, the filling gates are manually opened, but close automatically when the correct weight is reached. An intermediate position of the gate closing permits dribble of the aggregates prior to the final cut-off. The batcher is equipped with a three beam scale and springless indicator with mercury contacts for automatic closing of the filling gate. The batcher is a product of the Blaw-Knox Co., Pittsburgh, Pa.

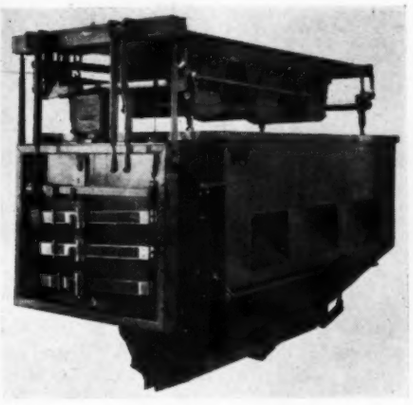


Blaw-Knox Weighing Batcher

Johnson Multiple Material Batcher

The C. S. Johnson Company of Champaign, Ill., who have furnished batching and mixing plants for most of the large dam jobs, also maintain their complete line of batchers and bins which are extensively used in road work.

The batcher here pictured is a multiple material type. It is readily convertible from 2 material to 3 material or vice versa. The batch hopper itself is all steel, welded construction, with steep sides and corners to insure rapid, clean discharge. Swing gate discharge is provided with long and narrow opening which prevents spillage when charging batch trucks. Covered overload removal ports are provided for each material.



Three-Material Multiple Batcher Road Builders' Type

Each material is weighed on a separate beam. The beams are of special construction, being graduated in such a manner as to allow instant compensation for moisture content of the aggregate. Weights are indicated by a pendulum type beam balance indicator. Fill gates are easily operated and jam proof, choker weights being used on the gravel gates. This batcher is available in two sizes, for either half or one yard pavers.

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BITUMINOUS MATERIAL DISTRIBUTORS AND MAINTENANCE EQUIPMENT

New Features on Littleford Pressure Distributor

During 1936, Littleford Brothers of Cincinnati made several improvements in their Model "C" distributor. A new larger Viking positive pressure pump with 4-in. inlet and outlet connections is now used. A new type of fifth wheel drive for truck tachometer has been designed. It has a 16-in. x 4-in. pneumatic tired wheel with angle type drive (having no exposed gears). It is impossible for stones and bitumen to interfere with it. A tachometer on pump is now standard equipment. Full 3-in. opening quick acting gate valves are used on the manifold bar so that distributor may be filled from either side, spray with half of spray bar or use one handspray. An improved type of quick acting coupling has been utilized on filler ports, spray bars and handspray attachment. A new alloy that is especially heat resistant has been used in the combustion tube.

An air cleaner on air blower is now used. A new type of clutch on blower and fuel pump drive has been designed. All pipe connections are either flanged or welded, eliminating leaky joints.

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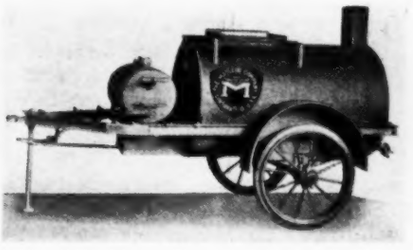
Macleod Type "FS" Oil Burning Kettle

Type "FS" is the newest addition to the Macleod line of oil burning kettles. The round tank has a coating of insulation with an outer steel jacket, thus retaining the heat and saving fuel.



New Macleod Kettle.

The heat from the burner travels back and forth through tubes within the kettle, thereby evenly heating the material and with no cold spots. The heated material cannot be spilled when trailing, and a flame shield protects the burner. The burner and the 20-gal. fuel tank are portable and can be taken off the kettle and used for other purposes.

These kettles are provided with steel wheels, solid rubber tires, or pneumatic tires, in capacities of 50, 75, 110, 160, and 210 gal.

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Rock Asphalt Heaters

In use of natural rock asphalt for street and highway maintenance it is frequently advisable to heat it before laying. This is especially true in cold weather or for handling material which has been stockpiled for some time.

Heated rock asphalt can be placed in holes or on depressed surfaces much better than cold material and makes a patch which stays in place. It also assumes full compaction under roller or tamper, which is not always obtained when laid cold.

While rock asphalt spreads and tamps readily in warm weather without special heating, difficulties encountered in cold weather are eliminated by heating. Thus satisfactory repairs can be made in all seasons.

In co-operation with the Kentucky Rock Asphalt Institute, a heating apparatus was produced by the White Manufacturing Co. of Elkhart, Ind. This consists of an all-steel box or heating chamber,

mounted on wheels or plain steel skids. Near the top of the box is a heavy wire mesh screen on which the rock asphalt is dumped or loaded. Immediately under the screen is an inverted V heat deflector which prevents direct flame contact with the bituminous material.

As the material becomes warm and dry, it drops through the screen into a lower compartment. It may be necessary to stir it to break lumps or to jar the screen so that material will fall through. A large hinged door permits the warm material to be shoveled out. In cold weather the asphalt can be kept in the box, if desired, during patching work and heat retained by throwing a canvas cover over the top of the unit.

Heat is furnished by a White self-generating burner held in a bracket at one end. Fuel is supplied from a 15 or 20 gallon kerosene tank.

▼

New Tar and Asphalt Melting Kettle

In a new type of tar and asphalt melting kettle developed by the Hauck Manufacturing Co., 126 Tenth St., Brooklyn, N. Y., the conventional firebox is eliminated.

The heat from the burner is distributed by a double return tube heating system inside the kettle completely surrounded by asphalt or pitch, thus cutting fuel consumption, because practically all heat generated is absorbed by the material.

Hauck 75-Gal. "Speed-Master" Melting Kettle

Another improvement claimed for the kettle is the "No-Freeze" draw-off cock which prevents cold material freezing in the cock, no delay being experienced when starting to draw off melted material in the morning.

Other advantages claimed are: sides, bottom and draw-off end of the kettle are effectively insulated. The entire heating system can be easily removed if and when necessary.

The kettle is built in 25, 50, 75 and 100 gal. capacities. It is of all-steel construction and furnished in either skid or wheel types, with a detachable fuel tank and burner which can be used as a separate torch heating unit. Catalog sheet No. 654 illustrating and describing these kettles will be sent on request.

Combination Supply Tank and Tool Box

This supply tank illustrated was built by Littleford Bros., 454 E. Pearl St., Cincinnati, O., for the city of Cincinnati. It is stated it will heat up 550 gal. of asphalt from a cold start in 90 to 100 minutes; once fully heated, the burner can be turned off and hot stuff can be drawn off all day long without further heating.

Since it holds all the paving tools needed by the gang in addition to over 500 gal. of material, no service truck is required to haul tools and kettle.

Actual capacity, 580 gal., tank elliptical in shape. Overall length of body, exclusive of pulling bar, 13 ft. 11 in. Approximate weight empty, 6,500 lb. Two No. 5 torch burners, 20 gal. A.S.M.E. fuel tank and two 6-in. dia. return "U" type heat flues make up the heating unit. Tank is insulated all over with 1 in. of Rockwool. Solid rubber tires all around. Springs semi-elliptical. Brakes are Timken Westinghouse 17¼x3, on rear wheels only. LB full turning fifth wheel, 72 cu. ft. of storage space for tools, 2½-in. draw off. Pulling hook for trailers built into rear end of unit.

Combination Supply Tank and Tool Box.

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New Streamlined Emulsion Sprayers

Emulsion sprayers for handling drum or packaged emulsions, light oils and tars have been made by Littleford Bros., 454 E. Pearl St., Cincinnati, Ohio, for several years, but new and exclusive features have been built into the 1936 line. A channel iron running gear is used on both the No. 93-AM and No. 93-OB. The main supply tanks are made longer, of smaller diameter. This adds to the streamlined effect of appearance and makes a stronger unit throughout. Pneumatic tired Timken roller bearing wheels are semi-elliptic spring mounted on the chassis. The pressed steel hood over the air cooled motor and compressor opens up, when unit is being used, to give complete ventilation and free access to all parts. A new and exclusive safety feature is built into the No. 93-OB unit (which handles cut-back, where heat is required). A simple but quite positive arrangement makes it impossible to operate the oil burner while pressure is being applied to the main tank. By the same device, it is impossible to apply pressure to the tank while the oil burner is burning.

Austin-Western Bituminous Distributors

The Austin-Western Distributor for 1937 features simplification of the valve and piping system and control levers. Another noteworthy improvement results in spray bars which are absolutely "dripless." There is absolutely no chance for the nozzles to drip after they have been shut off.

▼

SCARIFIERS AND ROLLERS

Scarifier

An adjustable tooth scarifier attachment for the Willett spring scraper was brought out by the Willett Manufacturing Co., Plymouth, Ind. The scarifier can be mounted on the scraper and has been used very successfully in cutting out ice ruts and in shallow scarifying jobs. Models and sizes of spring scrapers are manufactured for all makes of trucks, 1½ ton and up.

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A New Thing in Rollers

In producing the trench roller shown herewith, Galion Iron Works, Galion, Ohio, has supplied a long-felt need. It is especially designed for work on repair, widening, relocation and on some types of new construction work. The roller is powered with an efficient 4 cylinder engine. Maximum compression is secured by the distribution of weight. Controls are simple and easy to operate and are conveniently located in relation to the operator's seat. Adjustment is provided to level roller no matter what depth of trench the roller is working in.

Galion Trench Roller.

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Austin-Western Black Top Scarifier

A scarifier for reworking oil treated gravel and macadam roads was announced by the Austin-Western Road Machinery Co., Aurora, Ill. It consists of a 31-tooth unit, mounted in place of the blade and standard scarifier attachment.

The depth of cut is controlled hydrau-

lically from the operator's platform and either end of the scarifier can be raised or lowered independently. This permits the operator to operate with all teeth horizontal with the surface or set the teeth so that the front rows barely scratch the surface, while the rear teeth carry well into the material.

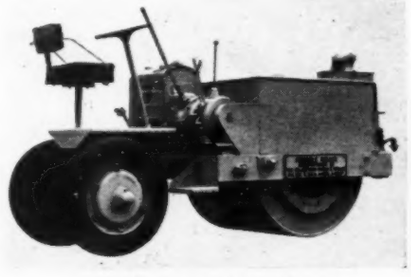
An adjustable blade set at the rear of the motor grader makes it possible to respread the material and windrow the excess in either direction.

Rigid control is assured by the use of hydraulic controls and ball and socket joints at all connecting points. The standard Austin-Western anti-chatter device holds the circle to the draft beams and prevents all play in operation.

▼

New Portable Roller

Early in 1936 Galion Iron Works, Galion, Ohio, introduced a power roller adapted to a wide variety of work, and especially designed for rapid transportation from job to job. Quickly attached to a truck and the roll raised off the ground by means of a hydraulic lift, it can be transported



Galion Portable Roller.

from place to place on its own pneumatic tires at truck speed.

The motor, transmission and compression roll are mounted in a sub-frame hinged at the back to the main frame by a large cross shaft mounted in bronze bushings and supported at the front by a yoke which is attached to the hydraulic ram used for raising and lowering the sub-frame. The hydraulic pump is hand operated and a valve is provided for changing from raising to lowering and vice versa. When the towing tongue is attached to the towing cross-member of the truck and sub-frame raised for towing, clearance of from 8 to 9 inches is provided under the compression roll. Water tank and sprinklers are provided for use when rolling hot or "tacky" material. This roller offers a compression range from 119 lbs. per sq. in. empty to 173 8 lbs. per sq. in. with roll filled with water.

▼

SPREADERS FOR AGGREGATES, SAND, CHEMICALS, ETC.

Adjustable Spreader

Easy pull, permitting use with the newer model Fords and Chevrolets, as well as larger trucks, is a feature of the adjustable spreader designed by The Jaeger Machine Co., Columbus, O., for laying stone, macadam and bituminous, both base and top. Main load is carried on 36-in. by 4-in. steel wheels, which operate on hard surface outside area of new material. Smoothness of spread is insured by mounting screed on floating runners, which ride the high spots independent of ups and downs of the wheels, thus insuring filling out of irregularities in subgrade.

Adjustability for 8 to 11 ft. widths of spread is built into the machine, eliminating "carrying back" and hand filling of narrow strips on roads up to 24 ft. wide. Provision is made for blending joints by bleeding material from gate on either side.

Cost of the machine is said to be little more than that of the ordinary spreader boxes, and it is stated it will lay gravel, rock, slurry, chert, armor plate, and hot or cold bituminous mixes, to depths of 1 in. to 10 in. of uncompacted material. It is stated, two Jaeger spreaders, used in parallel, have laid up to 2,000 tons of pavement in a day.

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Sand and Cinder Spreader

A sand and cinder spreader brought out by Portable Elevator Mfg. Co., Bloomington, Ill., is stated to be an all-purpose machine for municipal and highway use. The spreader operates behind a truck at 3 to 10 m.p.h., having a width of spread from 8 to 25 ft., depending upon the speed. Adjustable hopper slides provide accurate control of coverage, from a thin coating to a complete blanket if desired. The spread may be confined to

Little Giant Sand and Cinder Spreader.

desired portion of the street or highway without hindering traffic in the opposite direction. A positive-action agitator driven from the main axle prevents clogging or bridging of the material, even when it contains an unusual amount of moisture. "Free wheeling" clutches on the axle permit trailing the spreader behind a truck at ordinary traffic speeds, with spreading fans disengaged. Attachment to truck is by means of a telescoping tongue hitch, adjustable to any type of truck or body and providing a simple means of changing from empty to loaded truck in two minutes. The man in charge of spreading operations rides inside the truck body, safe from the danger of rear-end collisions. Wide tread, ground-grip tractor type balloon tires provide excellent traction and prevent slipping or skidding.

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Material Spreader

A new material spreader was announced by the All-Purpose Spreader Co., Elyria, O. The device is attached to the back of a dump truck, materials being dumped through an opening in the end gate into a large hopper. The material is then discharged through a manually controlled measuring gate in the hopper onto a whirling or revolving disc which casts the ma-

Material Spreader in Action.

terial onto the ground in a circular or umbrella-shaped shower of material.

The power for whirling the disc comes from the traction of the four industrial-type pneumatic balloon tires on which the spreader rests. These tires are mounted on wheels fastened to a horizontal axle which passes through an automotive type differential which in turn drives a vertical axle which is connected to the disc. Thus as the unit is traveled over the road the traction of the tires causes the disc to revolve in proportion to the speed of the unit. All propelling gears are run in lubricant.

▼

Improved Highway Spreader

Improvements in their Michigan special highway spreader for the distribution of all anti-skid and ice control abrasives, as well as chloride, salt, and road building materials used in stabilization and surface treatment, were announced by the Benedict Manufacturing Co. of Big Rapids, Mich.

Designed in the traction driven axle, centrifugal disc manner, the device advances to offer an arc throw to the rear only, with the fan shaped spread entirely free from obstructions and enabling quickly adjustable spreads of from 10 ft. to 30 ft. The coverage per square yard is governed by a lever controlled orifice directly over the spinner disc, and meets the maximum requirements for all uses. It is stated the truck may be driven in the right-hand traffic lane close to the edge, and yet give a spread completely over to the left-hand edge of the road. A simple adjustment sets the ma-

chine for center or left-hand travel where desired. Spreading may be done in either direction of travel.

A maximum degree of safety is attained through a high 3-sided welded guard rail on the rear of a large anti-slip platform, and the use of the hopper for a forward guard. Only one operator is required, as the truck dumps the material directly into the hopper without shoveling. The same man effects the change-over between trucks unaided in about one minute.

Michigan Special Highway Spreader.

All propelling parts and bearings run in lubricant. Cast steel and shielded-arc welded steel are employed throughout.

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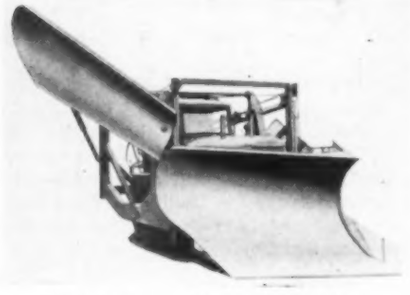
SNOW PLOWS AND SNOW LOADERS

Baker Snow Plow

The tractor snow plows of the Baker Manufacturing Co., Springfield, Ill., come forth in 1936 with several brand new features. Full power hydraulic control is used for both the "V" and side wings. The wings are flexibly mounted and controlled by a distributing valve in the tractor cab, using separate hydraulic cylinders. Twin cylinders operate the main plow, also controlled from the cab of the tractor.



Baker Snow Plow Model 230.

Sharp sweeping moldboard curvature, interchangeable moldboard, down pressure in addition to more substantial moldboard reinforcing and sturdier, more elaborate wing supports feature the new models.

Hand hydraulic lift is employed on certain models for medium size tractors and for light industrial tractors.

Willett Speed Plows

Willett Manufacturing Corporation of Plymouth, Ind., announced the building of a complete line of new models of hydraulically operated speed snow plows. These include "V" type and one-way blade plows, interchangeable on the same mounting attachments, hydraulically operated for trucks of 1½-ton to 10-ton capacity; reversible-tip blade plows, and hydraulic-operated wings for installation on heavy-duty trucks that may be used independently of or in conjunction with their heavy-duty speed plows; also full hydraulic tractor snow plows. The light plows are available for operation with hand pump in the truck cab, or may be operated by the Willett electric hydraulic pump unit which operates off the truck battery. In the heavier plows and wings, operation is by means of a roller bearing continuous-running oil pump with power take-off operated from the truck transmission. The "V" type and blade plows are built with special curvature of moldboards to facilitate the speedy removal of snow.

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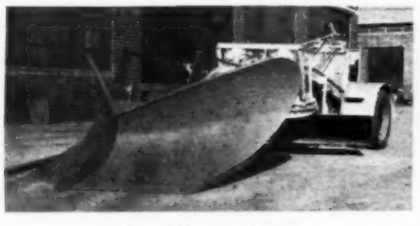
New High Lift Snow Plow

The high lift snow plow here shown was recently introduced by Galion Iron Works for use on the various one-man graders in the Galion Line. This plow employs new angles and curves in the moldboard. The rolling throw keeps the snow moving and carries it far and high to the sides of the cut. Plow is equipped with glider shoes and makes an exceedingly rigid unit for snow removal at high speed. Control is either manual or hydraulic depending on the type of grader the plow is to be used on.



Galion High Lift Plow.

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Adams Motor Grader Snow Plow

A new "V"-type snow plow for use on highways and city streets was announced by J. D. Adams Co. of Indianapolis, Ind.

The plow has an effective cutting width of 11 ft. 6 in. In installing, no special holes need be drilled or extra work need be done on the grader. The plow has been designed to secure light weight, balance and strength, and is curved to handle the maximum amount of snow with a minimum of power. The manufacturers claim it is the largest ever built for use on a motor grader and that it will handle more snow than was ever before possible with any motor grader.

In raising and lowering, the plow always remains parallel to the ground, so that in any position the front and back are an equal distance from the ground. The plow may be raised 14 inches off the ground to clear obstructions. Three shoes, one on each side and one on the front, combined with a hinge arrangement, permit free oscillation on bumpy and rough going. This allows the blade to conform to the contour of the road at all times.

The height of the plow is 42 in. in front and 78 in. in rear. The cutting edges are readily interchangeable.

▼

Plow Combines Push-Plow Blade With 42-In. Rotor

A combination rotor and blade designed to eliminate snow banks from the road and yet retain the speed and flexibility of the blade plow was announced by the Snow Removal Equipment Co., 557 Bryant St., San Francisco, Calif.

"Rotoblade," as the unit is known, is stated to cut a swath 9 ft. wide, rolling the snow toward the rotor, which, whirling at 500 r.p.m., throws the snow from 40 to 60 ft. clear of the highway.

In operation the "Rotoblade" gets its power from a power take-off direct from the truck's drive shaft. The entire unit weighs less than 3000 lb. and can be attached or detached in 30 minutes. It is stated that at special speeds varying from 6 to 20 miles per hour the rotor has been successfully operated in snow varying in depth from 6 to 20 in. According to its manufacturer, "Rotoblade" is not intended for use as a road opener, neither is it claimed that it will function in snow from 6 to 8 feet deep.

FWD Truck Equipped with a Hewitt "Rotoblade" Plow

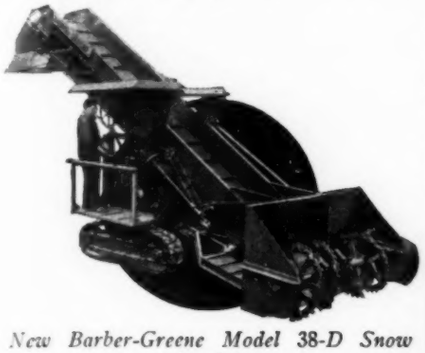
For city street snow removal a chute is placed over the rotor to control the discharge and load a truck driven alongside. A swath 9 ft. wide is first cut by a blade plow shoving snow away from the curb toward the middle of the street. The loaded truck follows this swath with the "Rotoblade" in the center of the street. Snow is loaded directly into the truck as it moves forward. This plan removed "windrows" formed along sidewalks and which were often not removed for several days. Sometimes picks and crowbars have been required to remove this hard-packed snow, necessitating extra expense for this labor.

New Snow Loader

The Barber-Greene Co., Aurora, Ill., announced a new snow loader having a spiral feed that is claimed to give a uniform feed from the full working face, greatly increasing the feeding ability under tough conditions.

The spiral feed is positive up to the capacity of the Barber-Greene automatic overload release, a patented feature which drives the spirals. The tension of the overload release is adjustable. When the spirals strike an unforeseen obstacle hidden in the snow, the release slips and immediately resets itself. This protects the machine from strain.

This 1937 model Barber-Greene has a new high traveling speed of 2 to 3 miles



New Barber-Greene Model 38-D Snow Loader.

per hour combined with the positive travel ability of full crawler mounting.

One of the most valuable features on this new machine is the side discharge shuttle conveyor, an optional extra. This gives the operator instant control, obviates the need of having trucks back under.

This new snow loader has the added advantage of being easily converted into the Barber-Greene Model 82 bucket loader for handling sand, gravel, etc.

▼

1937 Model La Plant-Choate "V" Plow

Special features and improvements found on the 1937 model, full-hydraulic La Plant-Choate snow plow, announced last fall by La Plant-Choate Co., Cedar Rapids, Ia., are: first, down-pressure on the plow as well as lifting pressure. This down-pressure forces the plow into the hard packed snows, and prevents the plow from riding out, as was the case where plows depended upon weight entirely, for suction, in the past.

These plows are, also entirely track-mounted, without the rear cross member as in the past. This type of mounting gives the snow plow a much higher lift and prevents the tractor from high-centering on the side frame when the tracks are spun, as was often done when the plow had a frame completely surrounding the tractor.

Higher lifting and longer wings enable the plow to throw the snow farther out from the center of travel. A dividing board in front of the "V," enables the plow to use the full width of one side when pushing back side banks, and prevents spilling of materials back into the road.

Another special feature incorporated in the design of the La Plant-Choate new model plows is a tractor mounting which enables the owner to back out of a "V" type plow and drive into a roadbuilder or bulldozer, thus utilizing the same hydraulic controls which were used with the plow. These plows are designed for use with a Caterpillar RD-7 tractor.

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STREET SWEEPERS AND WEED MOWERS

Highway Mower

The Silver King highway mower brought out by Fate-Root-Heath Co., Plymouth, O., is a one-man unit, that is stated to take slopes up or down at an angle of 30 degrees while the cutter bar location gives the operator a full view of the ground ahead. It is stated that the finger touch control of the cutter bar enables the operator to work in ditches over and around obstructions and to

Silver King Highway Mower, Showing High Lift Cutting Over Curb.

mow close up to poles, trees and fences, up and down slopes and over berms and curbs.

The total weight of the tractor and mower is approximately 2,600 lb. The engine is a Model IXA Hercules developing 20 H.P. at 1,400 R.P.M. The unit has a transportation speed of 25 m.p.h. and cutting speed of 1 to 2.25 m.p.h. in low, 3.85 miles in second, 5.5 miles in third and 1.5 miles in reverse. The turning radius of the unit is 9 ft. 6 in.

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Highway Mower

A new self-containing mowing unit, designed for mowing highway shoulders, railroad right of way, public parks, etc., was placed on the market by the Rome Grader & Machinery Corporation, Rome, N. Y.

The mower is easy to operate, small and compact, facilitating operation in corners and congested spots, among trees and other obstacles; yet its strength is ample to carry a hardy 6-ft. or 7-ft. cutter bar. The engine is a 14 H.P. rating, 4 cylinder, 3 in. bore, 4 in. stroke.

Some of the features claimed for the new mower are:

Quick acting steering gear; gears cut from special analysis steel; forgings are heat treated and hardened; shafts run on roller bearings packed in grease; engine is oiled by simple pressure system, requiring no attention; all gears, and the differential, run in oil, and are cased in for protection from dust and dirt; short wheel-base—designed for one-way corner cutting—but can be steered in either direction; solid construction of drive wheel, axle and differential side gear is simple, efficient and strong to resist shock when turning corners; operating levers are in the same location as in an automobile, greatly simplifying the problem of the beginner in operating the machine; three-point engine suspension on a three-wheel machine eliminates strains; shaft arrangement is simple; transmission is simple and compact, of automobile type design. Three speeds forward and one reverse; engine clutch is single-plate type in the fly-wheel, and is particularly simple in construction and operation; knife clutch is arranged to release and obviate damage to the knife when obstructions are encountered; knives are especially designed for high-speed cutting; starting crank, set at an angle, is exceptionally simple.

▼

Two-Way Tractor Sweeper

Tractor Sweeper

A new tractor sweeper was placed in production by the Frank G. Hough Co., 919 North Michigan Ave., Chicago.

This sweeper sweeps either to the right or to the left. It is equipped with a hydraulic lift for ease in raising or lowering the brush.

Many improvements, such as ball and roller bearings, fully enclosed gear boxes, are incorporated in this new machine.

Sweeper-Blower

A unit that will sweep and blow at one operation, for use in cleaning base for bituminous treatment, was added to the line of road sweepers of Frank G. Hough Co., 919 North Michigan Ave., Chicago, Ill. This unit is of the same general design as the company's Universal road sweeper.

The sweeper-blower is built on a 5-in. I-beam chassis and mounted on Timken bearing pneumatic tire wheels, thereby

Universal Sweeper-Blower

enabling it to be moved from one location to another with speed and ease. The brush and the blower are driven by a 30 H.P. Hercules engine properly sealed from dust filtration. The blower fan is mounted on a ball bearing shaft and driven by a four V-belt drive assembly.

The air is discharged through a scientifically designed nozzle permitting the delivery of a larger volume of air at the proper pressure. This nozzle is constructed so that it may be easily adjusted to meet all working conditions.

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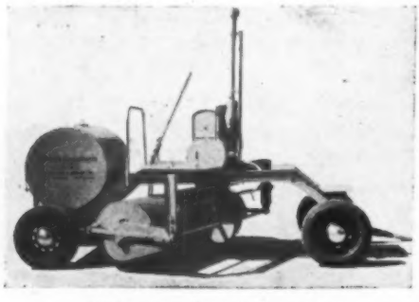
Street-Sweeper

The Frank G. Hough Co., 919 North Michigan Ave., Chicago, Ill., offered a new addition to the road sweeping line designed to meet the street sweeping



Universal Street Sweeper

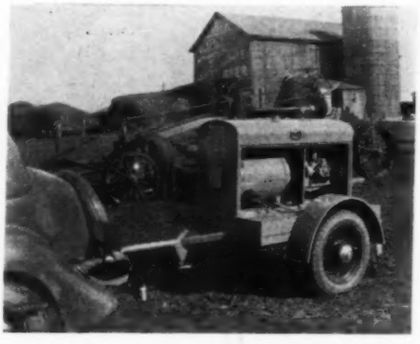
problem of the smaller cities and towns at low cost.

The Universal sprinkler-sweeper can easily be pulled by a small tractor or truck as the brush takes its power from a 4-cylinder engine mounted on the sweeper. This machine sweeps either to the right or left without raising a dust as water is sprayed under pressure just ahead of the brush.

WELDERS AND ELECTRODES

New Arc Welder

A new arc welder of 150 ampere capacity announced during the past year by the Harnischfeger Corporation of Milwaukee, Wis., known as the P&H Hansen "Smootharc" Model W-150 Welder, was designed to cover a broad range of welding jobs, using bare or coated electrodes from 3/32 in. to 3/16 in. for welding materials of varying thicknesses. Welding is simplified through single current control accomplished by shifting brush holders for current settings over the entire welding range. For field service, the standard unit can be mounted on a 2-wheel highway trailer to travel safely behind an automobile or truck at average motor car speed. The trailer is of sturdy, all welded construction with engine and generator protected from road shocks by automotive type cantilever springs and balloon tires. Large tool boxes are mounted on each side of the welder for convenience in carrying equip-



P&H Hansen "Smootharc" Model W-150 Welders

ment and accessories. Motor and generator are mounted on a single steel bed plate for minimum vibration and proper permanent alignment. The W-150 is also available on a small 4-wheel industrial truck for factory use with skid mounting.

Electric motor equipped models, either stationary or on a two-wheel truck, are driven through a V-built drive. Gasoline motor equipped units are driven direct connected with 2,200 R.P.M., mounted on a steel base.

The generator is a standard P&H Hansen "Smootharc" design with patented eternal stabilizer winding, which provides unusually high arc efficiency without the use of external resistors, reactors or separate stabilizers.

▼

Welding Electrodes

An entirely new line of coated rods for D.C. welding is now being made and sold through the Harnischfeger Corporation of Milwaukee, manufacturers of P&H Hansen Arc Welding Equipment. The present line includes five different types with both high and low rates of polarity for various types of work in welding in flat, vertical or overhead positions with ferrous and non-ferrous metals. Service tests show tensile strength of welds 55,000 to 75,000 lbs. per square inch with various types of rods ranging from 3/32 in. to 3/8 in. in size. "Smootharc" electrodes are designed primarily to speed up welding operation with a smoother, more easily handled arc and to reduce spatter losses.

▼

New Welder by Hobart

The arc welder here shown has just been introduced by Hobart Brothers Company of Troy, Ohio. It has what is

Serial MN Current-Saving Model Welder.

termed "Selective Motor H.P. Control," and an improved type of wheel mounting with low center of gravity.

The new "Series MN Current-Saving Models" are available in 75 amperes, 1½ to 3 H.P.; 100 amperes, 2½ to 5 H.P.; 150 amperes, 5 to 10 H.P.; 200 amperes, 7½ to 15 H.P.; 300 amperes, 10 to 20 H.P.; 400 amperes, 12½ to 25 H.P.; and 600 amperes, 20 to 40 H.P.

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MISCELLANEOUS

Novo Pavement Breaker

A highly mobile pavement breaker was brought out by the Novo Engine Co., Lansing, Mich. The demolishing hammer can be fitted with various breaking noses which will break the concrete to specifications depending upon the use it is to be put after it is broken. It is stated that uniform pieces from 6 in. to man-size can be broken.

The breaking nose can be replaced with a cutting knife which, it is stated, will cut asphalt on a hair line for pipe line excavation or between car tracks, and also can be used for trimming the edges of pavement or widening jobs.

For the majority of breaking jobs the hammer usually has to be raised but 3 ft., thus increasing the number of blows that can be struck in a given time.

The outfit can be installed on any standard 1½-ton or larger motor truck having a length of at least 126 in. from back of cab to end of truck frame. When the outfit is in transit the hammer is carried in low position at bottom of leads. The frame is hinged half way up to allow for lowering to traveling position.

The Littleford Traf-O-Spray

A new idea in traffic line painting machines has been evolved by Littleford Bros., of Cincinnati, Ohio. It consists of a DeVilbiss trigger operated hand spray gun, a motor compressor unit and a DeVilbiss paint container mounted on a streamlined running gear having three pneumatic tired wheels. Machine is short coupled so that it will readily paint curves as well as straight lines. Any standard traffic paint, lacquer or even emulsion may be used.

Other uses for the Traf-O-Spray make it of value in a multitude of ways. The gun requires about ten seconds to be removed from spray head. As a hand paint spray outfit, the machine can be used for any kind of painting or spraying—guard rails, stencils, airway directional signs, buildings, equipment. Another use is disinfecting.

▼

Newly Developed Cable Offset Fittings

The illustration* shows two types of cable offset fittings (patented) that have been developed by the Malleable Iron Fittings Co., Branford, Conn., as alternates to standards for several states. The type shown at the left is designed to have the hook member compress the cable

Cable Offset Fittings

tightly in the housing before the shoulders on the hook seat against the housing. This type provides firm clamping action at each post.

The type shown at the right is designed so that the shoulders on the hook member rest on the edges of the housing before compressing the cable, thereby permitting a free-running cable which is essential for all compensating end anchorage construction. Both types are now made to fit various shapes of posts.

▼

New Diesel Lubricant

A new lubricant for "Caterpillar" Diesel engines was developed by the Sinclair Refining Co., New York, N. Y. The new lubricant, known as Sinclair Ten-ol, is claimed to possess the following ten service factors that cut operating and maintenance costs:

1. High film strength under high temperatures and pressures.
2. Resistance to ring sticking even when operating with high output.
3. Abnormally low cylinder liner and piston ring wear even with overloads.
4. Open oil channels and free acting oil control rings.
5. Low blow-by of gases so that corrosion of cylinder walls and contamination of the crankcase oil are practically eliminated.
6. Non-carbonizing.
7. Non-sludging.
8. High oiliness.
9. Economical oil consumption.
10. Uniform quality.

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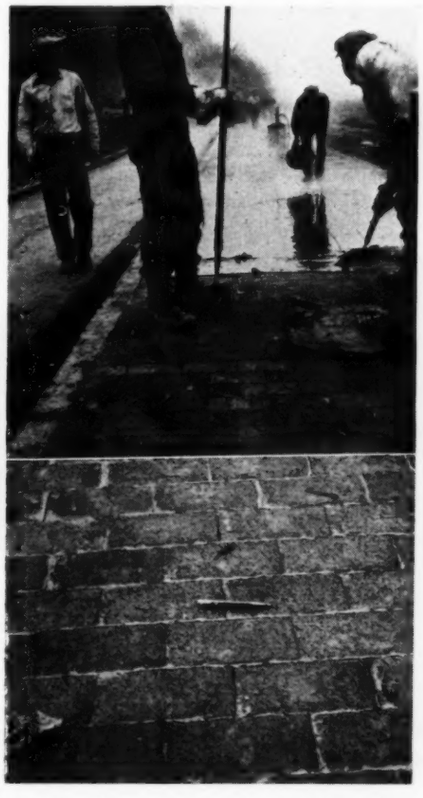
The Barrett Company Introduces Improved Pitch Block Filler

An improved pitch filler for brick, granite block, and similar pavements has been developed by The Barrett Company. Several years have been devoted to experimental work. Test sections of highway have been installed and observed



Upper Picture: Removing Pitch from Brick.
Lower Picture: Surface of Brick After Removal of Surplus Pitch.

under varying traffic and climatic conditions.

The new pitch filler has all of the advantages of the old pitch filler in that it does not require excessive heating, adheres to the block, fills the joints thoroughly, is an efficient waterproofing medium and has a long life under service conditions. In addition, the new pitch filler is less susceptible to temperature changes, is stable in hot weather and is not brittle in cold weather. It can be removed from the top of the blocks easily and will not extrude out of the joints and recover the tops of the blocks.

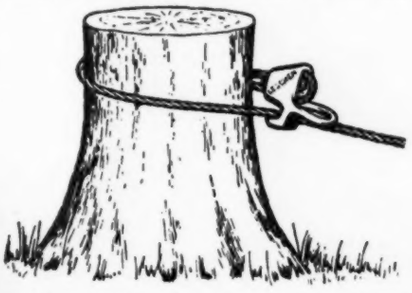
Technical specifications for the new material have been prepared and are now available.

The new pitch block filler will be marketed by the various local branches of the Tarvid Department of the Barrett Company. The material will be shipped in metal drums containing approximately fifty gallons each.

▼

Stump Puller Hook

A stump puller hook of new design was brought out by A. Laschen & Sons Rope Co., St. Louis, Mo. Because of the wedge socket, the hook can be attached to a rope quickly, easily and securely—in the field as well as in the



Leschen Wedge Type Stump Puller Hook

shop. No babbitt or spelter is required, and no tools are necessary. The large hand bail makes for convenient handling. The hook has a large, smoothly curved bearing surface for the rope. It is made of alloy steel. The hook is made in two sizes: No. 1, suitable for ⅝-in. or ¾-in. wire ropes; No. 2, suitable for ⅞-in. or 1-in. wire ropes.

▼

Tires for Construction Equipment

Three types of tires which apply particularly to contractors and operators using equipment for building and maintaining roads were brought out by The Goodyear Tire & Rubber Co., Akron, O.

Sure Grip Truck Tire—Designed for off-the-road service this tire embodies

Sure Grip Truck Tire

an extra tough and deep non-skid tread with a rugged carcass of Supertwist construction. During 1936 the Sure Grip was made available in both High Pressure and balloon sizes. The heavy, wide and high profile bars have demonstrated their ability to provide traction in muck, sand and loose dirt under conditions where ordinary truck tires would be wholly in-

adequate. The peculiar construction of the tread pattern also protects against side slipping. The Sure Grip is unusually efficient in deep snow, as well, and makes it practical to use on snow plows without the application of chains. While intended primarily for off-the-road service, the tire's big center rib will provide

Pneumatic Lug Tire

for quiet, comfortable riding on smooth pavements.

Pneumatic Lug Tire—Built for service under extremely unfavorable conditions, the pneumatic lug truck tire is well suited for trucks on such operations as strip mining, rock quarrying or dam building. The tread is built of a special snag resisting compound which also will resist cutting and chipping from sharp rocks and other hazards. The heavy, diagonal cross-lugs are self-cleaning and will bite into soft surfaces to provide traction. The finest grade long

Implement Type Lug

staple Pima cotton is used in construction of the tires' carcass and extra-strong bead construction protects them from the punishment of heavy, swaying loads. The tire has a high profile tread shape, which puts more rubber on the ground and gives great pulling power.

Implement Type Tire—This tire was specially built for rolling vehicles which normally are pulled by tractors or trucks. With this purpose in mind the designers worked with a view to providing a tire that would roll easily and at the same time prevent side slip. The Sure Grip tread pattern has been adopted for this tire, but the profile is very shallow to make rolling easy. The tire is particularly applicable to such vehicles as scrapers and dirt buggies where load carrying ability, rather than traction, is the prime requisite. In addition to its qualifications for free rolling and sustaining of heavy loads on soft underfooting, the tire has a special patented bead construction which makes it capable of performing its appoint missions under most unfavorable conditions.

▼

Bethlehem Steel Highway Guard Post

The new steel highway guard post that the Bethlehem Steel Company is bringing out permits great economy in guard rail erection costs as it is not necessary to dig post holes in erecting these

An Installation of Steel Highway Guard Posts.

posts. By utilizing a special driving cap that has been designed, they can be driven into the ground with a sledge; and erected in this manner the steel post affords resistance to impact or sidethrust equal or superior to that of wood posts. Tests indicate that this H section or stanchion design post with 4-in. flanges has bearing power on the soil equivalent to a 6-in. x 8-in. wood post. The posts can be provided in any weights or dimensions desired.

▼

Self-Priming Centrifugal Pump

A new line of highly efficient self-priming centrifugal pumps of the most advaiced design ranging in size from 2 in. to 8 in. and having capacities in accordance with the standardized ratings of the Contractors' Pump Manufacturers' Association, was announced by the Sterling Machinery Corporation, 411 Southwest Blvd, Kansas City, Mo.

Some of the noteworthy features of this new construction are larger pump cases, quicker priming action, built-in check valves, double grease seal, rugged, sturdy construction and entire absence of gadgets and settling tanks.

A radical departure is made by this company in the construction of their new 4-in. 40M pump (shown in the illustration), 6-in. 75M pump, 6-in. 90M pump and 8-in. 125M pump. All of these have the impellers mounted on a sturdy shaft supported by two heavy duty ball bearings which is driven from the engine by a heavy duty flexible coupling of improved design. The support bracket for the pump is bolted to the engine to assure permanent alignment.

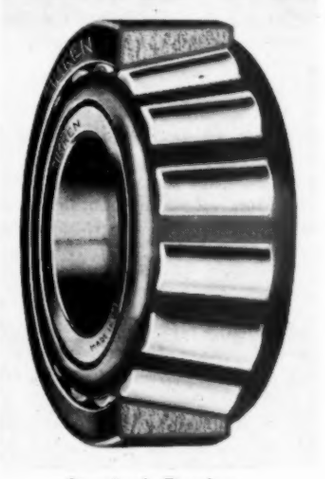
▼

New and Standard Timken Products

During the past year the Timken Removable Rock Bit has been substantially improved by adding metal to increase its strength for use in larger and heavier type drilling equipment. Likewise improved technique in steel manufacture

Improved Timken Rock Bit

and heat treatment has made it possible for Timken to increase the depth of hardening in their rock bits as indicated in the accompanying photograph. These improvements increase cutting efficiency and



Standard Bearing

prolong the useful life of the bits as they can be reground more times and still retain the necessary hard cutting edges backed up by a tough, resilient body.

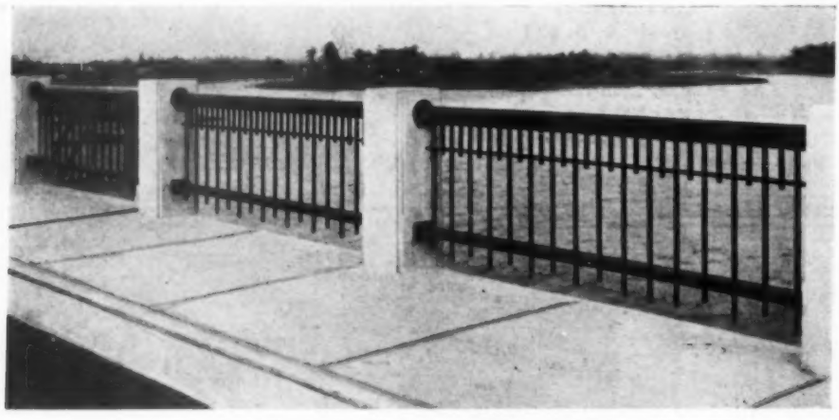
Timken Bearings have not changed in principle or design, even though manufacturing technique has improved their

qualities. The improvements are not ordinarily visible, but show up in improved operation and longer life, both of which are evident in the construction equipment in which they are playing an increasingly important part. Long life, friction-free operation and easy adjustability will always be essential in construction equipment, and these features are all found in Timken Tapered Roller Bearings.

▼

Wrought Iron Bridge Rail

The railing here shown was fabricated by Hall-Hodges Co., Inc., from wrought iron furnished by A. M. Byers Company, Pittsburgh, Pa. It is located on the Hampton Boulevard Bridge, Norfolk, Va., and was designed by the city Norfolk Engineering Department. Among the many claims made for this type of rail are the following: Durability, strength, low-cost, flexibility of design, and unobstructed view of the surrounding country. The metal for these railings is available in the form of pipe, plates, bars and light sections. It is extremely resistant to corrosion, the surface of the metal provides a natural bond for paint, and lends itself readily to welding.



All-Welded Wrought Iron Bridge Railing.

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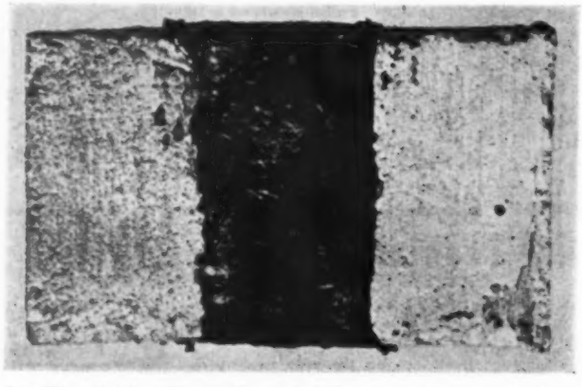
Poured Rubber Seal for Expansion Joints

A cold mixed and poured sealing compound for transverse and longitudinal joints on concrete roads is manufactured by the McCarty Aniline and Extract Company, Inc., 72 Cliff St., New York City, who pioneered and developed a material that would compress with expansion and extend with the full contraction of the concrete pavement slab, not extruding or permitting the entry of water or inert substances in the joint area. The development of this product, known as Sta-Tite Flexible Rubber Expansion Joint Material, is due to the co-operation of many highway officials. Specifications covering it have been issued by the States of Massachusetts, Connecticut, Rhode Island, and New York—also by the Transit Commission of the city of New York and the Triborough Bridge Authority.



Sta-Rite Rubber Expansion Joint Between Concrete Surfaces.

Aluminum Bridge Paint

Under the name "Permite," Aluminum Industries, Incorporated, Cincinnati, Ohio, has developed an all-purpose paint in completely ready mixed form. In the highway field, such paint finds extensive uses in the construction and maintenance of bridges, guard rails and other structures.

The producers of "Permite" have just issued an interesting 45-page book, which includes a report of the development of the product and an outline of the requirements of different forms of maintenance painting: interior, exterior, walls, celings, stacks, tanks, heated surfaces, etc. The proper type of "Permite" to use for each purpose is described and illustrated. Included, also, is an interesting chart showing the types and physical properties of the paint for different applications, such as the oil length, viscosity, drying time, baking time, percentage of thinning required, etc.

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New Spring Bracket for Cable Guard

A spring bracket for multiple cable guard has been recently developed by the Bethlehem Steel Company, designed to be used either with wood or steel posts. The bracket is constructed of high tension spring steel and supports either 3 or 4 cables at a distance of 6 in. from the post, thus deflecting vehicle impact away from the post and utilizing the cushioning effect of the cables in tension, as well as that of the spring bracket itself, at maximum efficiency. The pockets of the clips by means of which the cables are supported on the bracket permit the free movement of the cables, distributing vehicle impact shock over several posts. Yet the broad bearing surface on the cable checks cutting or wearing away of the galvanizing. This is an important point, as corrosion of cable progresses rapidly once the galvanizing is destroyed. The bracket can readily be applied to guard posts already erected, and existing guard rails of the 2-cable type thus made over if desired into the safer 3 or 4-cable type. The spacing of the posts can be varied as desired and the clips are designed to accommodate any type of cable. Provision is made for attaching the bracket to either a wood or steel post by means of a single bolt.

Bethlehem Steel Bracket for Cable Guard.

Hydraulic Control Hose

A complete line of hydraulic control hose for use on dump trucks, snow plows, graders and other portable equipment, was introduced by the B. F. Goodrich Co., Akron, O. It consists of a specially compounded oil-resisting rubber tube; one, two or three plies of exceedingly strong braided wire, with a layer of braided cotton and a rubber cover. In sizes ¾ in. and larger, a layer of cotton duck is embedded in the rubber tube to prevent the development of pinhole leaks. All braids of wire and cotton are inserted in rubber.

Length of Goodrich Hydraulic Control Hose with Eastman Coupling Attached, the Coupling Being Cut Away to Show Its Grip on End of Hose.

The hose is designed to elongate slightly under pressure, thus preventing pulling out of the couplings.

Owing to the method of braiding, this hose bends easily when pressure is applied and remains pliable at normal working pressures. The wire braid, which is exactly laid, allows flexibility but does not permit rotation or torsion.

Goodrich hydraulic control hose is available in sizes ranging from ⅜ in. to 1¼ in. A permanent, pressed type of coupling is recommended and supplies by the manufacturer but the hose construction permits use of any of the standard detachable types, if desired.

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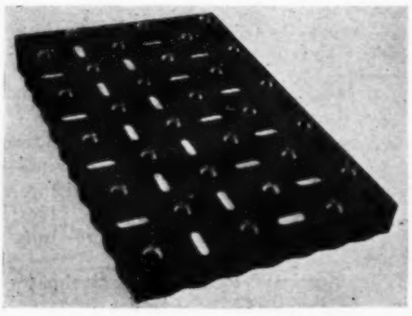
Steel Paving Plates

Bethlehem Steel Company, Bethlehem, Pa., placed on the market a new type of permanent and protective surfacing for concrete floors and paving, designated Bethlehem steel paving plates which are designed for installation on the surface of concrete slabs to which they are anchored and with which they become, in effect, an integral part.

These Bethlehem steel paving plates are of ⅛-in. rolled steel, and are available in two sizes. One is intended for use on roadways; the other for plant floors, loading platforms, and docks. Both types are identical, except that the one for roadways is equipped with button-head studs, making it a non-skid plate. As shown in the accompanying illustration, the sides are perpendicular to the surface and are so crimped as to give the plates firm anchorage in the concrete. Additional anchorage is provided by studs which extend into the concrete. And, when these plates are laid the fresh concrete fills the slots to the top of the plate, providing additional bond between concrete and plate, and at the same time, increasing its non-skid surface.

The anti-skid or road-type plate is applicable to thoroughfares, such as tunnels and bridges, that carry extremely heavy, continuous traffic.

The floor-type Bethlehem steel paving plates find application in warehouses, breweries, docks and loading platforms where heavy goods are ordinarily conveyed on trucks with steel wheels of small diameter and small flange width, which are very hard on floor surfaces. Like the road plates, Bethlehem steel paving plates of the floor type are anchored securely to the concrete slab and become, in effect, an integral part of it. They are built to stand up through unusually long periods of severe service. The standard size of these Bethlehem paving plates is 12 in. by 18 in., with 1½ in. sides.



Bethlehem Steel Paving Plate.

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Blaw-Knox Self-Aligning Road Form

The self-aligning feature of the road form brought out by the Blaw-Knox Co., Pittsburgh, Pa., is accomplished with two wedges on each of the stake pockets. The upper wedge is operated by hand until it contacts the stakes. This takes up the usual clearance between the wedge and the stake, eliminating movement of the form when final locking it done. The lower wedge is then driven up with a hammer for final locking. This prevents movement of the form from line or grade and permits quick and accurate form setting even though the stakes be bent or driven crooked.

Blaw-Knox Self-Aligning Road Form

WHO, WHAT AND WHERE AT THE ROAD SHOW

The following is a list of the exhibitors at the 1937 A. R. B. A. Highway Exhibit, as complete as we could make it at the time of going to press. The items show, in order, the name of the company, the booth number, nature of exhibit, names of representatives in attendance, and their hotel headquarters:

The Asphalt Institute, C51 and C70—Soil stabilization panels and models. J. E. Pennybacker, Managing Director; Prevost Hubbard, Bernard E. Gray, F. C. Field, Henry Krieger.—Roosevelt Hotel

Allis-Chalmers Mfg. Co., A70-A71, A50-A51—Pictorial display of products and motion pictures. H. C. Merritt, W. A. Roberts, G. M. Malmo, M. Noel, A. F. McGraw, E. Abramson.—Jung Hotel.

The Buda Company, A28-A29—Three Diesel engines, Model 6-LD-275, 6-LD-468, 6-LD-909. P. K. Mangan, A. F. Ashtman and others.—Jung Hotel.

Galion Allsteel Body Co.—Miniature of most recent hydraulic hoist, Model GH-56, and panel displaying important parts of hoist. E. R. Montgomery and E. Krieger.

Koppers Company, A24 and A25—An electrically controlled setting which introduces products of all the divisions, subsidiaries and affiliates, which are used in the highway and public works fields. Tar and Chemical Division: G. M. Forker, M. D. Gill, P. L. Griffith, H. S. Scott, A. R. Taylor. The Wood Preserving Corp.: B. M. Goodwin, J. E. Grennan, C. C. Lord, R. Putman.—Jung Hotel, New Orleans Hotel.

Schram, Inc., A-30, A-31—Model 105 cu. ft. utility compressor. Henry N. Schram, President; A. O. Witt, F. H. Wharton and W. C. Rea.

J. D. Adams Co., A-5 and 6—Elaborate display which will feature the name "Adams" and a complete display of every unit in the Adams line will be shown in action pictures. This pictorial showing will show each unit in the Adams line, working on all kinds of jobs.—Jung Hotel.

American Concrete Expansion Joint Co., C20—Expansion and contraction joints, load transmission devices. J. H. Jacobson, C. H. Westcott, H. A. Durr.—Roosevelt Hotel.

American Manganese Steel Co., A44-45—One piece body, renewable lip dipper, castings. W. M. Black, V.P.; T. A. Ratkowski, Chief Engr.; W. A. Henderson, Repr.—Roosevelt Hotel.

Anthony Co., Inc., B15—Back display board showing a cutaway hoist with mechanism in operation, lights indicate degrees of tip. For each 10 deg. of body tip marks on piston shaft indicate stroke. Also cutaway cylinder. R. R. Howard, Vice-Pres. and Sales Mgr.; W. C. Anthony, Pres.; C. H. Worrells, Treas., and A. E. Loder, J. G. Reinhard and C. H. Montelius of the Sales Department.—Jung Hotel.

Athey Truss Wheel Co., A75.—One Model D1-1 15-ton Forged-Trak wheel assembly. J. A. Roberts, H. R. Anderson, B. F. Lease, D. R. Dewar.—Roosevelt Hotel.

Armco Culvert Mfrs. Assn., B13-B14—Multi Plate pipe and arches, asbestos-bonded paved invert pipe, perforated pipe, metal crib retaining wall. S. R. Ives, H. E. Cotton, W. H. Spindler.—Jung Hotel.

The Austin-Western Road Machinery Co., A-22, 23, 47, 48—Motion pictures, transparencies, and a demonstration of Hydraulic Power Control, showing how power is multiplied, and how this type of control makes possible instant response and precision adjustments. S. F. Beatty, H. M. Kleiser, F. L. Jerome, A. O. Teckemeyer and H. F. Barrows—Roosevelt Hotel.

The Barrett Co., B-18—Photos, booklets, etc., descriptive of Tarvia and Tarvialithic paving materials. Geo. E. Martin, Paul Macy, C. H. Olmstead, O. A. Brand, F. E. Banville, V. C. Otley, H. F. Klinker, A. D. Carpenter, G. B. Hestle, B. C. Cowart.—Roosevelt Hotel.

Bendix Products Corporation, A-38, 39, 40.—Brake assemblies, carburetors, power brakes, magnetos, shop equipment. A. E. Feragen, H. S. Cole, J. M. Ravenna, Geo. Vogelsong.—Roosevelt Hotel.

Blaw-Knox Company, 39-40—Decorative background with panels of enlarged-colored photos in motion. A. A. Levison, R. T. Harris, Wm. Bolliett.

The Buda Company, A-28, A-29—Diesel engines, Models 6-LD-275, 6-LD-468, 6-LD-909. R. K. Mangan, A. F. Adtman, and others.—Jung Hotel.

Calcium Chloride Association, C-48-9—Two spaces exhibiting uses of calcium chloride in highway construction, soil stabilization featured. R. A. Giddings, B. C. Tiney, Fred Burggraf.—Roosevelt Hotel.

Caterpillar Tractor Co., A-78 to A-81—Talking moving pictures of road building and maintenance, industrial movies, etc. C. A. Spears.—Roosevelt Hotel.

C. H. & E. Manufacturing Co., A-64—One centrifugal pump, five or six actual size photographs cut out and mounted on plywood backing, series of "on the job" photographs. Frank F. Hase, Pres.; John H. Hase, Vice-Pres.—Jung Hotel.

Chain Belt Co., Milwaukee, Wis., B-49 and B-50—Attractive colored action pictures on the complete line of Rex construction equipment, animated models, interesting movies on Rex pumpcrete, the pump that pumps concrete, Rex pavers and Rex moto-mixers. B. F. Devine, Sales Mgr.; G. K. Vail, Vice-Pres.; C. F. Ball, Chief Engr. Construction Equipment Division, A. E. Miller, District Mgr.; G. E. Cooper, District Mgr.—Monteleon Hotel and Roosevelt Hotel.

Cleaver-Brooks Co., C-74—Cleaver Tank Car Heater, mounted on a 2-wheel rubber tired trailer with return condensate system. R. E. Brooks, J. C. Cleaver.—Jung Hotel.

The Cleveland Tractor Co., B-35, B-36, B-41, B42—A specially designed booth featuring our new streamlined models. Theme of exhibit, "A Symphony in Steel." Cletracs, new in appearance as well as in advanced engineering, low fuel consumption and operating advantages, will prove itself the "Standout of the Show." W. E. Miles, D. A. Milligan, L. D. Ogle, M. West, R. Stratton, T. A. Morrow.—Roosevelt and Jung Hotels.

Continental Motors Corporation, B-2, 3, 4—PY91 Enclosed Unit, C143 Open Type Unit, PF218 Enclosed Unit, PD202 Enclosed Unit, PE383 Enclosed Unit, PR501 Enclosed Unit. L. Sheldon, Sales Mgr.; I. A. Homrich, Sales Representative.—Roosevelt Hotel.

Concrete Surfacing Mchy. Co., B-32—Highway, road surfacing for roads, Berg concrete surfacing machine for building bridges, Berg cleaning tool, removes rust and other imperfections off steel and iron. A. Dreifus.—Roosevelt Hotel.

Construction Machinery Co., B-45, B-46—Pictorial display of mixers and other CMC equipment. The "Dumpover" pneumatic tired concrete cart will be featured. L. S. Holden, Pres.; G. A. Loveall, Vice-Pres.; H. M. McDermott, Vice-Pres.; James H. Smith.—Roosevelt Hotel.

Deere & Company, A-74—Booth decorations showing enlarged action scenes of our industrial line of tractors. R. B. Lourie, Deere & Co.; W. P. Webster, John Deere Tractor Co.—Jung.

E. D. Etnyre & Co., B-11—Meeting space with catalogs, photographs and small distributor parts; road oil, tar, asphalt and emulsion distributors; street flushers and street sprinklers. Geo. M. Etnyre, Secy. & Treas.; Arthur C. Rerick, Gen. Factory Executive; George E. Pearson, Eastern Manager; Charles T. Hvass, Special Representative.—Jung Hotel.

The Euclid Road Machinery Co., A-27—Motion pictures, panels, decorative pieces, etc. E. F. Armington, R. M. Kolze, H. E. Orr, R. A. Trippeer, Mgr. Memphis Branch Office; V. D. Roland, Mgr. Roanoke Branch Office.—Hotel Roosevelt.

Fairbanks, Morse & Co., A-82-3-4-5—Diesel engines for application to road building equipment, gasoline engines, lighting plant, motors, pumps, magnetos, wheelbarrow scale and a weight printing dial scale. T. M. Robie, H. N. Anderson, C. S. Konzelman, F. J. Bartella, G. J. Podlesak.—Roosevelt and New Orleans Hotels.

The Foote Company, Inc., B-43—Moving action pictures of both concrete pavers and black top pavers. J. Curtis Harford, D. D. Kennedy, J. M. Fitzwater.—Hotel Roosevelt.

Four Wheel Drive Auto Company, A-42—Photographs of the complete line of FWD four wheel drive trucks, together with literature and direct mail matter. Walter A. Olen, Pres.; R. H. Schmidt, Gen. Sales Mgr.; W. C. Merrill, Sales Representative; possibly others.—Hotel Monteleone.

Fuller Mfg. Co., A-54—Truck transmissions. E. L. Ludvigsen, Sales Mgr.; W. E. Niness, Sales Engineer; E. L. King, Service Mgr.

The Galion Allsteel Body Co., A-72, 73—One miniature dump body Model No. 12, one 1937 model of AH-56 hydraulic hoist, 1 parts panel. B. J. Heiser, E. Krieger, E. R. Montgomery, New Orleans Distributor.—Roosevelt Hotel and New Orleans Hotel.

The Galion Iron Works & Mfg. Co., A-43—Photographs and literature. John L. Connors, John S. Boyd, J. E. Morton and Ed. J. Saxton.—Roosevelt Hotel.

General Motors Truck & Coach, A-41—Photographic displays. LaSalle Schmidt-Fleet Sales, Representative; George Oliver, Factory Sales Engineer.—Jung Hotel.

W. S. Godwin Company, Inc., A-77a—Samples of steel paving guards used to protect the edges of curbs, streets, roads and railway paving. W. S. Godwin.—Roosevelt Hotel.

The Gorman-Rupp Company, C-36, 37—New 1937 Model Triplex Road Pump delivering 100 G.P.M. at 600-lb. pressure or through three miles of 2½-in. pipe, 2-in., 3-in. and 4-in. self-priming centrifugal pumps. J. C. Gorman, President.—Hotel Monteleone.

Gruendler Crusher and Pulverizer Co., C-43—Model Jaw Crusher, Model Rock Crusher. Two or three people.—Monteleone Hotel.

Harnischfeger Corporation, B-33, B-34—Continuous movies of P&H Pacemaker excavators on the job. Full size crawler assembly of the Model 150 showing the tractor type features; 150 amp. gas driven trailer welder and welded parts. Mr. Harnischfeger, F. Salditt, C. W. Daniels, W. Burdick, W. L. Hartley, J. Enochs, W. Wickes, H. A. Carlton, L. Cauble, M. M. Phillips.—Jung Hotel and Roosevelt.

The Heil Co., C-25, C-26—Enlarged photographs of Heil Dump Units and Heil Scrapers. Also Cut Away Heil Hydraulic Hoist. W. S. Scruggs, Julius P. Heil, Jos. F. Heil, John Nelson.—Roosevelt Hotel.

The Heltzel Steel Formoc Iron Co., A-76, 77—Models and photos of road forms, street and sidewalk forms, batching plants, trail graders, subgrade testers, finishing and joint machines, finishing burlap and one-man bridges, pipe molds, sewer forms. J. N. Heltzel, B. M. Clark, F. McCaffrey.—Roosevelt Hotel.

Hercules Motors Corp., A-34, 35, 36, 37—Hercules heavy duty four and six cylinder engines and power units, both gasoline and Diesel. J. C. Keplinger, A. B. Wehling, C. R. Schuler, D. W. Latta.—Roosevelt Hotel.

Hetherington & Berner, Inc., C-46—Descriptive literature of company's various lines of asphalt plants. Robert Berner, President; R. B. Berner, Secretary.

Heltzel Steel Form & Iron Co., A-76, A-77—Models and samples of steel forms for concrete paving, curb-and-gutter, curb, sidewalk and also bituminous paving forms. Photographs of bins and miscellaneous equipment. J. N. Heltzel, President and Treasurer; B. M. Clark, Sales Manager; and Frank McCaffrey, Sales Manager of the Flexible Road Joint Machine Co.

The Frank G. Hough Co., B-62, B-63—Models, moving pictures. F. G. Hough, P. H. Lash.—Monteleone Hotel.

The Hug Company, C-60—Model 87Q Hug Roadbuilder. R. K. Tibbetts, C. J. Hug, J. H. Hamilton.—Jung Hotel.

Insley Mfg. Corp., A-55—Enlarged photographs of Insley equipment including our new ⅜-yd. Type "K-10" excavator, semi-trailer dirt wagon, round type bucket, shoulder finisher, pneumatic tired concrete carts, etc. W. H. Insley and R. B. Dorward.—New Orleans Hotel.

International Harvester Company, A-32, A-33—A display of the applications of Internation Trucks, International Tractors, TracTracTors, and power units. W. F. McAfee, C. E. Stevens, W. C. Schumacher, R. C. Flodin, Wm. Parrish, Neal Higgins of Chicago office, and S. E. Foster, Mgr. New Orleans Tractor Branch; J. O. Lambeth, Mgr. New Orleans Truck Branch.—Roosevelt Hotel.

Iowa Manufacturing Co., C-23—Photographs of equipment, also one crusher on skids with electric motor drive. H. Hall, Pres.; Kenneth Lindsay, V. P. and Sales Mgr.; A. C. Gossard, Asst. S. M.—Roosevelt Hotel.

The Jaeger Machine Co., A-50, 51, 52, 53—Photo display boards showing mixers, pumps, paving equipment and truck mixers. Movies showing bituminous paver and mix in place. Machine actual pump demonstrating tower with glass tube showing priming, also 6P pump and sample forms. Lion Gardiner, E. G. Mandt, Scheuerman, V. G. Mandt, A. S. Millikin.—Roosevelt Hotel.

Johns-Manville, C-62—Display of Johns-Manville Cork Expansion Joint, J-M bridge plank and friction materials. A. Peck, J. B. Jacob.

C. S. Johnson Co., C-35—Models of new products in the bin line, featuring a new three-way convertible bin for truck mixer or road builder plants. Information will also be available on new completely mobile mix plant for small jobs. Photographs and literature will be available on Johnson's latest installations on all size jobs. C. S. Johnson, J. R. Steelman.

Kinney Manufacturing Company, A-26—Sixteen transparencies showing views of up-to-date Kinney distributors and also three historic pictures, one being 1911 horse-drawn Kinney distributor with pump driven from rear wheel of wagon; 2nd, old power takeoff type with heaters, 1915 model mounted on Kelly truck; 3rd, 1919 machine with separate engine to drive pump. W. E. Worcester, H. G. Saunders, C. D. Campbell, Jr.—Jung Hotel.

Koehring Company, B-9, 10, 27, 28—Display material without equipment. W. J. Koehring, L. E. Long, C. A. Koehring, A. E. Holcomb, John Bachman, F. J. Dixliso, E. H. Lichtenberg, E. J. Loes, all from home office. Also many distributors.—Roosevelt Hotel.

La Plant-Choate Mfg. Co., Inc., B-22, 23, 24—Literature and pictures of products. R. E. Choate, H. N. Graves, G. A. Bailey, W. I. Leech, J. L. Morgan, E. H. Graves, M. L. Coonlow.—Roosevelt and De Sota Hotels.

A. Leschen & Sons Rope Company, B-44—A complete line of samples of the various grades and types of wire rope required by the equipment used in highway construction. E. E. Cole and D. G. Berglund.—Roosevelt Hotel.

R. G. LeTourneau, Inc., B-22—Photographic displays of our equipment in operation on owner's jobs. This will include the new Model "U" expanding "Carryall" scraper in 4 capacities: 18-yd., 12-yd., 9-yd. and 6-yd. J. W. LeTourneau, General Sales Mgr.; D. M. Burgess, Eastern Sales Mgr.; M. E. Miller, J. K. Harper, Salesmen.—Hotel Jung.

Lima Locomotive Works, Inc.—Photographs of late type machines and a small working model of one of the machines equipped as a clamshell. From outward appearance this small model is an exact duplicate of the larger machines and is so designed that it will go through all the major operations.

Littleford Bros., B-31—Novel display of lighted action pictures and new literature. New semi-trailer mounted Littleford Pressure Distributor is separate display outside. L. W. Glaser, Sales Mgr.; H. P. Haupt, Chief Engineer.—Roosevelt Hotel.

Link-Belt Company, C-44, 45—Interesting, brilliantly illuminated background of pictures; operating unit of new Link-Belt speed-o-matic effortless control for crawler shovels, draglines, cranes. G. H. Olson, General Manager; L. P. Spillan, Sales Manager; H. F. Allen, Chief Engineer, and several other representatives.

Littleford Bros., B-31—Display of novel action pictures and new literature. All the latest improvements on Littleford equipment for 1937 models will be displayed. A full size Littleford Model "C" Pressure Distributor mounted on an LB semi-trailer will be demonstrated in a private exhibit. L. W. Glaser, Sales Manager; H. P. Haupt, Chief Engineer.

Lone Star Cement Corporation, C-34—Space for the entertainment and comfort of guests. H. A. Sawyer, J. W. Johnston and L. R. Ferguson.—Roosevelt Hotel.

D. A. Lubricant Co., Inc., A-10—Display of packages, adv. literature, etc. Frank L. Binford, Pres.; L. C. Slicer, Vice-Pres.; J. S. Brown, L. S. Graham, F. C. Forrest.—Roosevelt and Jung Hotels.

The Lufkin Rule Co., B-54—Measuring tapes, rules and precision tools. R. M. Benjamin, D. W. Macomber.—St. Charles Hotel.

National Paving Brick Association, A-12—Samples of vitrified brick and an illuminated picture. G. F. Schlesinger, Engineer-Director; Q. A. Campbell, Asst. Chief Engineer.—Hotel Roosevelt.

Navo Engine Company, A-69—One small pump. E. P. Teel, Vice Pres. and Gen. Mgr.; R. B. Harvey, Sales Mgr.; G. W. Stevens, Southeastern District Manager.—Roosevelt Hotel.

Pioneer Gravel Equip. Mfg. Co., C-47—Model Jaw Crusher, Model Horizontal Gradation Screen. K. E. Brunsdale, Paul Giesel, W. R. Nichols.—Roosevelt Hotel.

Portland Cement Assoc., B-5, 6—Motion pictures and slide films showing the need for built-in highway safety features. Need for highway improvement to conserve motorists' funds. A. A. Anderson.—Roosevelt Hotel.

Ransome Concrete Machinery Co., B-59, 60, 61—Velour panel background with enlarged photographs of concrete pavers and mixers, showing the dual drum and single drum pavers, the new hot and cold bituminous paver, etc. There will be two natural wood side panels with a large working model of the Jack Knife skip hoist arrangement and details. The other side panel will show the non-by-passing poppet valve. L. R. Wilson, Treasurer; A. P. Robinson, Sales Manager; W. Muller, President, together with some local representatives.

W. A. Riddell Corporation, Bucyrus, Ohio, C-61—Electrically lighted display of photographs and small equipment models giving Diorama effect. N. E. Jersey, Manager Road Machinery; R. S. Spencer, Central States Field Representative.—Roosevelt Hotel.

Schramm, Inc., A-30, 31—New 1937 model DeLuxe Schramm "Utility" Compressor on two-wheel trailer with pneumatic tires. Introducing feature of lightweight, streamlined body, self-starting, etc. Also tools, parts feature exhibit. Henry N. Schramm, F. H. Wharton, Walter C. Rea, A. O. Witt.—Roosevelt Hotel.

Scintilla Magneto Co., Inc. (subsidiary of Bendix Aviation Corp.), A-38, 39, 40—Magnetos, spark plugs and ignition devices. A new popular priced line of Bendix magnetos for industrial engines, the PC series will be shown for the first time. J. H. Mayforth and J. A. Poole.—Hotel Jung.

Servicised Products Corp., C-32—Expansion joints, asphalt plank. E. O. Seeling, R. M. Simrall, R. D. Moyers, W. C. Fischer.—De Soto Hotel.

The T. L. Smith Company, A-60, 61—Booth display-photos of large construction jobs, catalogs, etc. No machines on display. H. E. Smith, H. C. Peters and F. E. Bager.—Hotel Roosevelt.

Solvay Sales Corporation, B-53—Display showing highway uses of Solvay calcium chloride, featuring stabilization of local soils roads. George H. Kimber, George P. Spencer, J. H. Elleman, R. A. Scott, E. N. McGee, F. H. Harris, C. O. Kingsbury, H. O. Pierce, H. P. Grissmer, Earl Arthurs, C. Kleinhans, W. C. Shallcross.—Roosevelt Hotel.

Speeder Machy. Corp., B-7—Literature, etc. T. M. Deal, Pres.; B. O. Eighmy, Sales Engineer—Roosevelt Hotel.

St. Paul Hydraulic Hoist Company, A-67—Miniature models of hoists and bodies, road machinery. A. F. Brooker.—Roosevelt and Jung Hotels.

Sterling Machinery Corporation, C-40—New Model 7M self-priming centrifugal pump equipped with new Wisconsin Model AB gasoline engine. New improved sawrig with double ball bearing mandrel. Electric motor driven pump with self-priming attachment. R. G. Barzen, R. C. Cameron and R. E. Ohler.—Jung Hotel.

Sterling Machinery Corporation, C-40—New Model 7M self-priming pump. A new and improved sawrig with a double ball bearing saw mandrel; standard electric motor driven pump with self-priming attachment.

Truscon Steel Company, A-15, 16—A large and comprehensive animated exhibit displaying the complete line of Truscon Steel Company products for the reinforcing of modern streets and highways. B. C. Briody, Manager, Highway Sales Div.; R. P. Dodds, Mgr., Advertising and Sales Promotion; A. C. Schreiber, P. L. Andrews, J. M. Lowry, Clifford Colomb.—Roosevelt Hotel.

Trackson Company, A-46, 47—Levee special crawler wheels, Trackson Bottom dump rubber tire wagon, Trackson tractor shovels and tractor equipment. L. E. Dauer, W. H. Stiemke, I. W. Kunert and L. M. Clark.—Roosevelt Hotel.

Toncan Culvert Manufacturers' Ass'n, A-13, 14—Toncan iron corrugated pipe, Toncan iron sectional plate pipe and arches. A. J. Roof.—St. Charles Hotel.

Tuthill Spring Co., C-28—Section of Tuthill highway guard rail and motion pictures of test of rail made by cars driven into it at various angles and speeds. Also display board showing Tuthill leaf springs. A. H. Moore, Pres.; Clelland Pohl, Sales Engr.—St. Charles Hotel.

Universal Crusher Company, C-27—Model crusher and photographic display. A. W. Daniels, L. W. Dunlap, L. S. Hackney.—Jung Hotel.

Wico Electric Co.—Models of magnetos, including the new rotary type AP and A, which have been on the market now for only a few months. A new flywheel type of magneto for small fractional horsepower engines. Aside from stationary display of these models and various parts which go to make them up, there will be three running tests displaying the rotary type magnetos, the new flywheel magneto and a special high speed test. President and General Sales Manager, E. L. Stoughton; Victor K. Hunt, Sales Manager, Trade Sales Division; Harrison I. Hart, Midwest District Manager; Leon F. Smith, Southwest District Manager; Joseph Jordan, Sales Representative out of the Tulsa office; C. L. Allen, Sales Engineer, Chicago office; Calvin G. Waters, Service Manager, and R. E. Phelon, Sales Engineer.

White Manufacturing Company, C-29—Concrete vibrator with appliances for vibrating, grinding, drilling and chiseling; photographic display of other White Manufacturing Company products. W. McK. White, O. E. Quinton, W. R. Sosthem.—Hotel Jung.

Williamsport Wire Rope Co., C-73—A working model of a tube strander which demonstrates the process of spinning strand to go into 1-in. 6x19 wire rope. A very interesting piece showing method of "Strand-Stuffing," a definite advancement in the manufacture of cable certain operations (see letter). Also some interesting auxiliary material such as sample-boards, etc. D. C. Sherman, Chicago office; Don De Veuve, New Orleans office; C. B. Hinton, Memphis Representative; Raymond Ford, Houston office.—Jung Hotel.

▼

FWD Export Manager Goes to Argentina

Charles S. Thomson, export manager of The Four Wheel Drive Auto Co., has embarked for Argentina, where he will make a business tour of three months. Born in the Argentine, where he learned the Spanish language as a youth before he mastered English, Mr. Thomson has a wide circle of friends in many South American countries. Until a few years ago, the export executive made his headquarters for the FWD concern at Buenos Aires. He plans to renew friendships and acquaintances during his short trip.

Traffic marker of Atlas White portland cement, on Wayside Drive, Houston, Texas. Contractor—Gulf Bitulithic Company of Houston.

Once in—they're in for good!

● No "extras" will ever be required with this traffic marker. Once in, there's no extra work—no extra expense. Its first cost is the last cost.

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